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UTAH HIGHWAYS

Vol. 1. August 1923 No. 1

OUR cover picture is a view of one of the numerous canyons opening into the Great Salt Lake valley from the east—in this instance a short stretch of road in Big Cottonwood canyon, about fifteen miles southeast of Salt Lake City. It is an example of the splendid scenic attraction coupled with good road construction to be found throughout this intermountain state.

That Utah is thoroughly alive to the advantage of safe and smooth-riding roads through her wonderful canyons and valleys is shown in a view of road construction in the canyon directly east of Ogden, through which a bituminous pavement has been completed through a ten-mile cleft in the Wasatch range to the upper valley at Huntsville, offering a delightful drive through a location of striking beauty.

A total of 225 miles of the state road system is now hard-surfaced, of which, as reference to the map of state and forest highways will indicate, the major portion is on the trunk line from Brigham north of the lake, to Nephi, near the geographical center of the state—a distance of 150 miles. Utah has 175 miles of concrete pavement on her state road system alone and leads the other intermountain states in this respect. A number of views of completed pavements of this type are included.

In the southern part of the state the completion of Federal Aid Project No. 26 has opened to traffic a ten-mile stretch of gravel road on the Zion Park highway and a cut shows a portion of the rather difficult location on this project near the head of Wild Cat canyon.

UTAH HIGHWAYS

VOLUME 1. AUGUST, 1923. NUMBER 1.

Foreword

On March 23, 1909, fourteen years ago, the law creating the State Road Commission was passed, and accordingly this branch of the state government came into being. This marked the beginning of an entirely new epoch in vehicular transportation in this state. The voice of the king of the road, the motor car, was beginning to be heard. There were but 2600 cars in the state in 1912, and where before with horse-drawn vehicles bad roads were tolerated, there came now an insistent demand for better highways.

The duties of this board were first to establish a trunk system of state highways, and with the means at their command and with the cooperation of county officials to approve the system as fast as possible. It is not the purpose here to dwell upon the achievements—yes, and the mistakes of the road commission in its history thus far, but in passing, we must be permitted to say that in this state, sparsely settled as it is, large of area, and a correspondingly large road mileage, there has been accomplished credible results, and the citizens of this state can well be proud of the splendid way in which the road officials have been supported with funds for the establishing and improving of modern highways to meet the ever-increasing use to which they are subjected.

With full realization that this commission is a public servant dependent upon the loyal citizens of the state for support and upon the county officials especially for cooperation, this publication is launched forth in the hope that a fuller understanding might be had of our common problems. It is the intention to place before the public regularly a statement of the disbursements, the progress of the work in hand, and the plans of the future. It is hoped also to point out the wonderful scenic value of our roads by description and pictures, and report from time to time on their condition for travel; and, in fact, to lay before the people of the state as plainly as possible their great road business which has a magnitude of about two million dollars per year.

Suggestions are earnestly solicited, as well as constructive criticisms from well meaning citizens and officials of the state, and all matter of this kind will be welcome for publication.

To those of our citizens who feel inclined to severely criticize the acts of the commission, we would reply that we fully appreciate the modern road building methods, both as to engineering features and the financing problems are in the experimental stage, characteristic of the new science that it is. It has been our aim to follow those principles of action which have crystallized by the mistakes and successes of our own and other state, and he who would deny these principles is betraying a lack of understanding of the definite progress which has been made in the science of highway administration, operation and financing.

Hair-pin turn on the Beaver-Millard Gravel Surface Project, F. A. P. 26

Utah's Federal Aid Highways Approved

On June 7, Secretary of Agriculture Wallace approved 1430 miles of highway out of a total of 3148.5 in the state road system as federal aid roads. Federal participation in highway improvement is limited by law to 7 per cent of the total mileage in the state outside of incorporated cities and towns. Utah's total mileage is 24057, of which 7 per cent gives 1684 as the maximum mileage which may receive federal aid. Since the present approved mileage is considerably less than 7 per cent of the total, additional routes may subsequently be submitted for consideration and approval within the 7 per cent limit.

The following routes are now included in the federal aid system:

1. From the Utah-Idaho state line near Franklin, Idaho, via Brigham, Ogden, Salt Lake City, Orem, Springville, Nephi, Cove Fort, Parowan and St. George to the Utah-Arizona state line southwest of St. George.
2. From the Utah-Wyoming state line near Evanston, Wyoming, via Echo City, Main Forks, Salt Lake City and Garfield to the Utah-Nevada state line at Wendover.
3. From Echo City to Ogden.
4. From Brigham to Tremonton.
5. From the Utah-Wyoming state line northwest of Evanston, Wyoming, via Randolph to the Utah-Idaho state line near Fish Haven, Idaho.
6. From Main Forks via Heber to Orem.
7. From Duchesne to the Utah-Colorado state line near Caisson, Colorado.
8. From Springville via Castlegate, Price, and Green River to the Utah-Colorado state line near Utaline, Colorado.
9. From Nephi via Salina and Sevier to Panguitch.
10. From Sevier to Cove Fort.
11. From a point in the federal aid road near Garfield to Tooele.

The federal law provides that 3 per cent of the highways approved for inclusion in the 7 per cent system shall be classed as interstate or primary roads and 4 per cent as intercounty or secondary roads; there being, however, no designation made as to the type of i provement which may be made on eith

The state road commission has s mitted to the federal officials a map which the primary and secondary s tems are tentatively outlined, but routes noted above are, at the pres time, approved without such classifi tion, in order that further study may made of interstate traffic.

The location for construction of p tions of the routes on the approved s tem will continue to be considered, pr ect by project, as heretofore. About per cent of the federal aid system is ready improved to government standa and in addition to this nearly 200 mi have been improved with federal aid are under construction as federal projects which are not included in the per cent system. These projects we submitted and approved prior to the 19 amendment of the federal aid act a when participation was based upon t improvement of post roads and did r necessarily contemplate a correlated sy tem.

FEDERAL AID PROJECTS UNDER CONSTRUCTION

No.	County	Name	Type	Length Miles	Project Agreement Est.	Percei Comple
5-ABC	Grand	Thompson-Moab	Graded Earth	37.79	$333,489.60	94
6-ABC	Grand-San Juan	Moab-LaSal Junction	Graded Earth	23.25	372,423.13	90
9A	Millard	Delta-Holden	Gravel Surface	10.61	113,605.42	82
9-G	Millard	Holden-Kanosh	Gravel Surface	5.14	29,146.30	85
9-H	Millard	do	Gravel Surface	5.75	30,478.61	80
9-J	Millard	do	Gravel Surface	7.80	46,919.33	64
9-K	Millard	do	Gravel Surface	4.98	25,487.81	84
12-A	Washington	Ash Creek-Andersons Ranch	Gravel Surface	7.30	87,070.67	45
12-B	Washington	Ash Creek-Andersons Ranch	Bridges—Concrete	.....	65,337.71	54
17-C	Juab	Levan-Chicken Creek Dam	Gravel Surface	9.04	73,627.34	60
19-A	Piute	Marysvale-Junction	Gravel Surface	12.56	79,485.21	99
33	Cache	Sardine Canyon	Gravel Surface	6.96	120,852.89	20
38-A	Box Elder	Brigham-Corinne	Concrete	4.0	113,239.73	49
39	Salt Lake	Magna-Tooele Co. Line	Concrete	6.41	210,674.70	26
41	Morgan	Morgan-Peterson	Gravel Surface	7.80	70,455.88	43
42-A	Wasach	Heber-Hailstone	Gravel Surface	7.46	68,904.85	10
42-B	Wasach	Heber-Hailstone Bridge	Steel Truss	.....	21,682.61	60
43	Sevier	Richfield South	Concrete	1.5	68,654.20	....
44	Sevier	Salina City	Concrete	1.5	49,630.10	....
45	Emery	Woodside Bridge	Steel Truss	.....	32,301.01	25
46	Rich	Woodruff-Wyoming	Gravel Surface	7.40	56,218.58	....
47-A	Sanpete	Moroni City	Concrete	1.0	38,940.73	....
47-B	Sanpete	Moroni-Fountain Green	Gravel Surface	7.09	53,298.19	....
47-C	Sanpete	Fountain Green	Concrete	1.0	32,774.95	....
47-D	Sanpete	Fountain Green-Juab Co. Line	Gravel Surface	5.33	45,064.48	....
48	Iron	Coal Creek Bridge	Steel Truss	.....	30,978.36	70
49	Summit	Gogorza-Salt Lake Co. Line	Gravel Surface	3.06	43,673.36	....
52	Sevier	Richfield South	Concrete	1.5	68,654.20	....

Projects Readvertised

F. A. P. 4-F

Castle Dale-Ferron; Emery county; 11.2 miles, gravel surface. The bids which were received June 25 for the construction of this federal aid project, together with the construction of the Rochester flat bridge, known as F. A. P. 4-H, were rejected on account of the excessive bid price for gravel surfacing. At the present time this project is being readvertised and a more comprehensive digest of the gravel pit situation has been furnished the contractors with the hope that more desirable bids will be obtained. This project is not on the 7 per cent system and therefore requires the use of the old Post Road funds as the federal government's share of the cost.

F. A. P. 10-B.

Ft. Duchesne-Vernal; Uintah county; 5.2 miles gravel surface. Bids on this project opened June 11 were also rejected, only one bid being received which exceeded considerably the engineer's estimate. The project is now being broken up into three contracts. The advertis ment should begin within the next fe days, as soon as some minor chang have been approved by the bureau public roads. These three contracts w consist of the grading and gravel su facing of 4½ miles; the construction four bridgs and the laying of 0.7 mi of rock asphalt. If satisfactory bids a not received on the asphalt surfacing, will be done by state force account, the state is very desirous of getting test section of this type of pavement.

UPP

Projects for Which Plans Are Completed

F. A. P. 17-A.

Scipio-Juab; Millard county; 7.08 miles gravel surface. Plans have been sent to the bureau for review. This project extends from the Juab county line to a point on the hills south of Scipio. Bids will be opened about August 10.

F. A. P. 17-B.

Chicken Creek-Millard; Juab county; 15 miles gravel surface. Plans on this project have been sent to the bureau of public roads for approval. Bids should be opened about August 10.

F. A. P. 24-C.

Plans on this project have been completed for some time, but due to difficulties in securing right of way and also a division of the costs of the underpass, which decision must be reached by the public utilities commission, it has been necessary to delay the advertising beyond expectation. However, it is expected that all matters will be adjusted and bids opened about August 1.

F. A. P. 31.

Riverdale Overhead Crossing; Weber county; 0.5 mile.

Plans for the railroad's portion on this project have been approved by the district office of the bureau of public roads with minor corrections. Plans for the highway portion have been submitted to the bureau for approval and are being reviewed by them at the present time. Bids for this project will possibly be received about August 20 to September 1.

F. A. P. 50.

Payson-Santaquin; Utah county; 8.56 miles hard surface. Plans for this project have been submitted to the bureau for approval. This year's program on this project contemplate the grading and paving of Sec. "A" between Payson and Santaquin, 3.88 miles, and the grading of the Santaquin line change, 1.25 miles. Next year's program will consist of the paving of the Santaquin line change and the grading and paving from Santaquin to the Juab county line, 3.43 miles. With the completion of this project and the Riverdale Overhead Crossing, F. A. P. 31, mentioned above, there will exist a continuous hard surfaced highway between Brigham City and Nephi.

F. A. P. 53.

Nephi City; Juab county; 1.75 miles hard surface. Plans on this project have been submitted to the bureau. Bids should be opened about August 10.

Plans in Course of Preparation

F. A. P. 51.

Timpie-Wendover; Tooele county; 74.2 miles gravel surface. Plans on Sec. "A" of this project, which extends from Timpie to Knolls, are 95 per cent complete and should be submitted to the bureau at such time as to permit of the opening of bids about Sept. 1, which would allow 30 days for advertising.

F. A. P. 56.

Redmond-Sanpete; Sevier county; 2.13 miles gravel surface. Plans on this project are 96 per cent complete. This project will be advertised with F. A. P. 57 between Gunnison and the Sevier county line and the date of opening of bids will therefore be controlled by this project, on which the survey has just been completed.

F. A. P. 57.

Gunnison-Sevier; Sanpete county; 10.37 miles gravel and hard surface. The survey notes for this project, as mentioned above, have just been received and the plans will be worked up. It is expected that bids for this project, together with bids on Redmond-Sanpeae job will be received about August 25. This will, it is hoped, permit of the reconstruction of the worst section of this road this fall.

F. A. P. 59.

Layton-Clearfield; Davis county; 4.11 miles resurfacing. Plans on this project are 75 per cent complete and it is estimated that bids will be opened about August 25. Plans will call for widening the present 16-ft. pavement 2 feet on each side with concrete and resurfacing with concrete 4 inches thick at center line. Steel mesh reinforcing will be placed throughout.

Surveys Now Being Made

F. A. P. 54 and 55.

Cedar Kanarra; Iron county; 11 miles, and Black Ridge; Washington county; 4.3 miles, gravel surface. Location of these two projects between Cedar City and the north end of F. A. P. 12, now under construction between Ash creek and Anderson's ranch, has been under way for some time. It was necessary to make three alternate locations on the 30 miles. It is expected that this work will be let sometime during the winter. The main features of the relocation consist of the improvement of the Black Ridge dugway in Washington county, which is a very steep, dangerous section dreaded by the majority of autoists. This will be widened to a standard width of 24 feet, reduced to a maximum grade of 5 per cent and gravel surfaced a width of 18 feet Mr. G. A. Gregory has charge of the location.

F. A. P. 58.

Brigham-Cache; Box Elder county; 3.0 miles gravel surface. The survey for the reconstruction of the road from the end of F. A. P. 33 through Sardine canyon west toward Brigham City is now under way under the direction of K. C. Wright. This will complete the connecting link between the hard surfaced pavement in Cache county and the hard surface pavement in Brigham, with a first-class gravel surfaced highway.

F. A. P. 60.

Echo-Emery; Summit county; 11 miles gravel surface. The location of survey for this project is now under way under the direction of Jos. M. Tracy. The state is endeavoring to secure the assistance of the Union Pacific railroad in the construction of this project. The railroad company having undertaken the widening of their main line track in this vicinity, together with the construction of the underpass and the relocation of the state highway, it became feasible to cooperate with them and to improve this 11 miles of gravel surfacing highway with only a slight cost to Summit county. The location as outlined will eliminate six grade crossings and will include the construction of one underpass.

F. A. P. 61, 62, 63, 64.

Sevier county. These will be four federal aid projects of gravel surface construction. It is proposed that Project 61 will extend from Salina to Aurora, a distance of approximately 4 miles. Project 62 will extend from Aurora to Sigurd, a distance of 7 miles. Project 63 from Sigurd to the north end of the present Richfield pavement, a distance of approximately 6½ miles; Project 64 from the south end of F. A. P. 43 (contract for which was recently awarded) to Elsinore, a distance of about 4½ miles. The location is under the direction of Carl A. Erikson and an effort will be made to let one of these projects this fall in order to furnish employment during the winter if weather conditions are favorable

Proposed New Work

F. A. P. 65.

Provo canyon; Utah county; 9.5 miles gravel surface. This project extends from the Wasatch county line down Provo canyon to Orem, a distance of approximately 9½ miles. The new work will consist of the widening and straightening of the present road, together with relocations to improve snow conditions. This location will be under the direction of L. Wendelboe.

F. A. P. 66.

Heber-Utah; Wasatch county; 14 miles gravel surface. This proposed project extends from Heber to the Utah county line down Provo canyon connecting with F. A. P. 65, a distance of approximately 14 miles. The Wasatch county commissioners have not decided whether they desire to make this improvement at the present, but decision will be reached this month in order that the location may be made this year if possible and the construction completed in 1924.

F. A. P. 67.

Scipio-Holden; Millard county; 12 miles gravel surface. The project extends from Scipio to Holden and connects with the two federal aid projects Nos. 17 and 9.

F. A. P. 68.

Millard county. This extends from Dog Valley in Millard county to the Beaver county line. It will be a gravel surfaced highway approximately 8 miles in length.

F. A. P. 69.

Beaver county. This project extends from the north end of the Wild Cat canyon federal aid project to the Millard county line connecting up with F. A. P. 68. It will also be a gravel surfaced project approximately 5 miles in length.

F. A. P. 70.

Juab county. This is a proposed gravel surfaced project between Nephi and Levan connecting up the hard surfaced F. A. P. 53 in Nephi City with the gravel surfaced project 17 between Levan and Scipio.

PEDESTRIANS ON HIGHWAYS

Using the railroad tracks for a promenade is a dangerous practice and constitutes a trespass. Walking on the paved highways is not a trespass but it's a lot more dangerous. Help to eliminate the accidents from this source by walking on the left-hand side of the road and look out and turn out for the cars, otherwise the driver of a car may attempt to pass you and an approaching car at the same instant with disastrous results to some one. By all means insist that school children observe this safety rule. Regulations which the California state motor vehicle department will present to the next legislature for enactment as law will make it illegal for pedestrians to walk on the right-hand side of the road where there are no sidewalks.

The Construction and Maintenance of Grave Roads in Northern Utah

By K. C. WRIGHT, Resident Engineer

Federal Aid Projects 33, 38-A

Gravel roads and gravel road construction are not being given the credit and attention that they deserve in this section of the state. The idea that a road surface constructed of gravel is only temporary and a step toward ultimate hard surfacing is prevalent but is not a fair valuation to put upon the merits of this type of construction.

The writer would not convey the impression that gravel roads in this part of the state are entirely without friends. This indeed is not the case. But to a majority of the users of the roads the gravel road is looked upon as a type to be endured rather than sought after.

But no matter how the gravel road may be viewed by the layman it is the predominating type that will be constructed for many years to come in this state with its "magnificent" distances, and it is therefore one of the problems of those in charge of roads to change the attitude of the average motorist and make of him a booster instead of a knocker.

The problem hinges on two fundamentals, (1) proper construction, and (2) proper maintenance. The public official in charge of roads must understand the fundamental principles involved in each and must see to it that his local problems are worked out in strict accordance therewith or he is doomed to fail.

The following observations are not presented with the idea of criticizing destructively nor is it claimed that a cure for all road ills is presented, but an attempt will be made to present some of the fundamentals in a non-technical way.

Construction

Proper construction involves (1) location and design, (2) grading, (3) surfacing.

Location and Design

Throughout this section of the state the roads are, in the main, already located and the location of new ones will not often arise; and hence, as a rule, the only application of the principles of economic location will be in the relocation of comparatively short stretches of roads. The original location may have been fit and proper when the region was new and undeveloped but the increase in the amount and character of the traffic may justify very considerable changes. Many roads would be materially improved by a careful relocation of certain sections.

A few general principles regarding the location and design of a road may be briefly stated as follows:

1. Avoid sharp curves, because such curves are dangerous, a menace to traffic and expensive to maintain. The curve in all cases should be of sufficient radius, that is flat enough to provide a clear sight distance of 200 to 300 feet. In general, also curves should be easier on grades than in level country.

2. Provide ample width for automobiles or other vehicles to pass each other without leaving the traveled way. The question of proper width will be discussed in a later paragraph.

3. Avoid, wherever possible, steep grades because when the time comes to improve the road by the addition of a high priced pavement, changes will have to be made to avoid these grades and such changes are made better and cheaper when the road is first being constructed.

4. Avoid all unnecessary distances, because not only the saving in first cost but saving in the perpetual additional cost of maintenance and the extra cost to vehicles and cars in the matter of operating expense.

5. Regard section lines and other land lines only when following them does not decrease the usefulness of the road or increase its first cost. Almost invariably roads built on section lines are abandoned when the road becomes of sufficient importance to warrant su facing with some foreign material.

6. Plan to avoid all subseque changes in the location. Such chang invariably work hardships on those wh have constructed homes and other in provements along the road.

Drainage

Drainage is referred to by many a thorities as the most important sing consideration affecting the location ar design of a public highway. This stat ment needs no amplification, it being matter of common experience that th action of water makes mud out of cla and earth and reduces the carryin power of all common types of road su face so that the surface is unable t withstand the loads that are applied to i

The following elementary principle may be advanced as to how water ma best be removed from the road bed.

1. The roadway should be crowned s as to shed the water off to side ditche as rapidly as it falls on the surface.

2. Wherever the road is in excava tion side ditches should be provided t carry the water out of the cut. It ma happen on steep grades that these sid ditches must be rip-rapped with cobble of such a size as to resist the action o the stream.

3. Provide ample curverts, not les than six to the mile, of size sufficient t carry water under the road at place where natural drainage channels cros the road. No rules regarding the placin of these culverts can be given here.

4. Water from one intersecting roa should not be turned down the sid ditches of another. Also the side ditc should not be used to drain farms at th road side.

5. An outlet should always be pro vided for borrow pits. If side ditche are constructed to drain into borrow pit which have no outlet the drainage systen will not be effective because as th water rises in the borrow pits it wil eventually reach an elevation which wil nullify the efforts that have been mad to keep the subgrade from absorbin water by capillary action.

Crown

The proper crown to give a road wil be a mean between two opposing factors (1) the crown must be sufficient so tha water falling upon the road will drai off the surface into the side ditch; (2) the crown must be flat enough so tha traffic will distribute itself over th entire surface. It would be conserva tive to say that 80% of the roads i this part of the state that are crowne at all are crowned too much. The re sult is that the traffic is confined almos exclusively to the center of the road o top of the crown. This concentration o traffic results in excessive wear and rut soon appear, one on either side of th center. The ruts thus formed hold th water and the road soon disintegrates In general it may be said that th steeper the grade the more the crown necessary because the transverse slope

Example of Curve Protection, No. Ogden-Hot Springs F. A. P. 32

of the road must be greater than the longitudinal slope or water will run along the road instead of off to the side ditch. Except in very extreme cases a crown of 1 inch per foot should not be exceeded and for level or nearly level country ¾ inch per foot will suffice.

Width

The minimum width to accommodate safely two lines of traffic is 18 feet. In order to safeguard against accidents a shoulder 3 to 4 feet wide should be constructed along side of the traveled way. In sparsely settled sections of the country a width of traveled way of 9 feet, or what is called a single track road, will prove sufficient. It must be borne in mind that sufficient width for passing must be provided so that it is generally not economical in the long run to construct a road of less than 24 feet in width, although only 18 or 19 feet need be surfaced if surfacing is done, depending upon the amount and character of the traffic.

Grading

All culverts and waterways extending under the road should be constructed before grading begins because (1) there is less excavation attached to placing the structure before construction, and (2) the structure with its backfill will have greater time in which to settle and become firm.

The grading of an earth road includes all excavation, filling, trimming and shaping necessary to complete the job in a satisfactory manner. The method employed depends upon the character and amount of work to be done. Where the graded cross section follows the original ground line closely the ordinary grader will be found most economical while the use of scrapers of various kinds will become a necessity where earth is to be hauled for any distance up to about 400 feet. For hauls of over 400 feet dump wagons will be found to be most economical. The method of loading the wagon depends upon the equipment at hand, and the size of the job, and will vary from loading with ordinary hand shovels to the use of steam or other power driven shovels and loading devices. The road official must give careful consideration to the problem at hand and decide upon the most economical method for the particular job.

In using a road grader for new work the best method to follow is as follows: (1) set a row of stakes 200 to 300 feet apart at the inside of the side ditch. The purpose of the stakes is merely to guide the driver on the first round. They will be knocked down the first round and so need not be anything more than a willow or other available stick (2) Make the first round with the blade set at an angle of 30 degrees with the road and the toe lowered and heel raised and the toe cutting 18 inches outside the stakes. The depth of the cut depends upon the amount of power hitched to the grader; ordinarily about 6 inches is sufficient to produce good results. (3) Make successive rounds, crowding out each time until the side ditch is constructed to the required cross section. (4) Crowd the loosened material toward the center and bring it to the desired crown by successive rounds. (5) After the required crown has been built up, reverse the blade and make several trips over the road. The blade will smooth and compact the surface better in this position. From 20 to 30 rounds will be required to do the entire job. (6) Go over the grade every day during the period when the material is settling, to prevent the formation of ruts.

Ogden Canyon Road, F. A. P. 30-A

Surfacing

The gravel surface should not be commenced until the grade has settled firmly.

Requisites for Good Gravel

The finished road cannot be better than the materials from which it is constructed. Next to proper drainage, the most important thing is the selection of proper materials. The gravel should consist of hard stone particles which will resist abrasion. From 60 to 75% of the pebbles should range in size from ¼ inch to 1½ inches and be graded in size. Stone particles above this are too large for road construction and the application of pebbles over this size to a road as surfacing material ought to be classed as a crime punishable by a term in jail. The gravel should, in addition, contain about 25% to 40% of a sand or clay mixture of which from 15% to 20% should be clay or other binding material such as iron oxide or limestone dust. Too much stress is generally placed on immediate packing qualities. Indeed, the average road supervisors have become so imbued with the idea that it is necessary to use a gravel that will pack quickly that they have almost lost sight of the fact that the only thing that makes a gravel road better than an ordinary earth road is the pebbles, real stones, that it contains and is dependent upon to resist wear and bear up traffic.

Authorities differ as to the amount of clay that should be present as binder, some claiming that an amount in excess of 10% is detrimental because of the tendency to form mud. However, it is the opinion of the writer that in dry climates, such as prevail in this section of the country, an additional amount of clay should be used because here the amount of moisture that falls throughout the season of the year when the road is most used is sufficient to aid materially in keeping the road intact and there is small danger of mud resulting from an additional 5% of clay.

The best field test to apply to gravel which is intended for use in road construction is to observe the pit carefully. If the binder is of satisfactory quality and sufficient in amount the gravel will stand on a practically vertical slope and will contain many lumps composed of numerous cobbles cemented together with the cementing material. Gravel that is found in a cemented state will recement when placed on the road. In case of doubt a 50-pound sample should be sent in to the laboratory to be tested. In language of Thos. Carlysle of New York state, "Do not use any material in the construction of a road unless you know before-hand what the result will be."

Excavating, Screening and Hauling

The pit having been decided upon the next step to consider is the method of getting the gravel out and on the wagons. If the job is small and the pit only a temporary one, the gravel may be excavated, screened and loaded by hand. If the job is of greater extent or the pit a permanent one, the installation of a trap with gravity screens will prove economical. In some instances the installation of elevating machinery and revolving screens may prove economical. It all depends upon the amount of gravel to be furnished.

Screening

There are a few banks, which contain gravel of proper quality, without screening, for the construction of a gravel road. For roads built to withstand very light traffic the oversized particles may be hand-picked, shoveled or raked out at the pit. But for roads constructed with any degree of care for moderately heavy to heavy traffic, too much care cannot be taken to separate the desirable from the undesirable portions.

The method to use depends upon the results to be obtained. If the problem is one of removing only the oversized materials it can be done by means of an ordinary grizzly. If the problem is to remove an excess of fine material as well as oversize, the system of screens will be more complex. (It is assumed in this discussion that the job is large enough to warrant the installation of a loading trap equipped with the proper size and arrangement of screens to produce the desired product.) The important

things to keep in mind in constructing the trap are (1) get it high enough to insure a slope of 1 to 1 on the screens; (2) locate the trap or design it so as to provide a suitable place for getting rid of the waste material.

The road foreman can save his salary many times over by carefully planning the job. All lost motion should be done away with. The ratio of teams hauling to teams in the pit should be kept at a point where all are working at maximum efficiency.

Then and there only can the supervisor say, "I am worthy of the trust that is being placed in me."

Method of Construction

There are two methods of applying the gravel after the grading is completed generally employed in constructing gravel roads. One known as the feather edge method and the other as the trench method.

As the name implies, the feather edge method gives a surface varying from nothing at the edges to any desired thickness at the center. The gravel is generally placed 8 inches thick in the center. None of the pebbles should be over 1½ inches in diameter and in spreading care should be taken to place the large stones in the bottom. The surface should be thoroughly harrowed to properly mix the materials together and to prevent the "wash board" effect so general in graveled roads. If the road is to be used immediately the use of a road roller to compact the surface is almost imperative. If the construction of a smooth surface can be deferred for some time the traffic will consolidate all the materials and continuous dragging will produce the desired surface. This method is not recommended except in the case of roads constructed to carry light traffic.

The trench method is the method which includes the construction of the shoulders first. Most state roads or other roads designed for heavy traffic are constructed by this method, since the shoulders form a firm support to the edge of the road and the thickness of metal is uniform, giving uniform support to loads carried and allowing for greater care in the construction of the road and the compacting of the materials.

The shoulders should first be constructed sufficiently high so that they will finish flush with the gravel when completed.

Roads constructed under this method are usually constructed in two courses each 3 to 4 inches thick. The gravel in the bottom course should vary in size from ½ to 1½ inches and in the top course from ⅛ to 1 inch with sufficient binder to bind the pebbles together.

As the gravel is hauled into the subgrade it is dumped in windrows. A grader is then used and several trips are made along the sides of windrow, shaping it to a uniform height and width. The material is then spread as uniformly as possible. Thorough harrowing is necessary after which the grader should be run over the surfacing to take off high spots and fill in the holes and leave the surface as smooth as possible. If a road roller is available this course should then be compacted skew angle of from 15 to 30 degrees. It is apparent that by shifting the position of the hitching link the angle of skew may be increased or diminished as the conditions require. When dragging immediately over ruts or down the center of the road after the sides have been dragged, it is usually preferable to have the hitching link at the center of the chain and to run the drag without skew. When the principal purpose of the dragging is to increase the crown of the road, they should be sufficiently skewed to discharge all material as rapidly as it is collected on the runners. On the other hand, if depressions occur in the road surface, the skew may perhaps be advantageously reduced to a minimum, thus enabling the operator to deposit the material which collects in front of the runners at such points as he desires and the next course placed in the same manner.

As was stated under the feather edge method, traffic will eventually consolidate the material if a roller is not available. Continuous dragging is necessary until the surface becomes smooth and. firm

Looking south along the Main street of Ephraim, Project No. 29

The writer is cognizant of the fact that the methods set forth herein are radical departures from those now in vogue in the various counties. However, he is in strict accord with the following statement taken from a recent bulletin by Prof. William Peterson of the U. A. C. bearing on this subject:

"In general maintenance is reduced as the quality and completeness of the work is emphasized in construction."

"Maintenance is the most important item of work to be considered in road management. It is always admitted that anything constructed for practical utilization depends upon the amount of effective maintenance it receives. Therefore roads which are most widely used and exposed in all their parts to the worst of elements relatively should receive the highest degree of attention, and moreover the higher type of construction and the more it costs the more marked attention will it require."

Besides eliminating the difficulties and discomforts of travel, careful maintenance is the only way the road can be made to last long enough for the public to realize anything like a fair return on the money invested in the original construction of the road.

Quoting Prof. Peterson again:

"Money spent in roads, if not protected, depreciates faster than in any other legitimate expenditure that can be made. An earth road may be built at a cost of $3,000 to $50,000 per mile and if given no attention the investment will be entirely obliterated within five years.

"The question, when should maintenance on a newly constructed road begin, has been asked by several, the answer is definite and undebatable. Maintenance should begin a few days before the road is completed and very special attention should be given the road as soon as it is thrown open to complete use."

The patrol system of maintenance is the most effective system yet devised for maintaining roads, but as this system has not been adopted universally, the discussion of this subject will be limited to the system now employed, that of periodic repairs.

All common types of road, i. e., earth, sand-clay, and gravel roads are most effectively maintained by the same methods, dragging. It matters not whether this operation is done with a small drag or a grader the underlying principles are the same. The following, taken from bulletin 31 by the U. S. bureau of public roads, is so complete and well stated that it is reproduced here:

"The principle factor in successfully operating a properly constructed road drag, provided that the condition of the road is favorable, is skill on the part of the operator. Under ordinary circumstances the position of the hitching link on the draw chain should be such that the runners will make an angle of from 60 degrees to 75 degrees with the center line of the road, or, in other words, a by lifting or otherwise manipulating the drag. The length of hitch is another very important consideration in operating the road drag. It is impracticable to prescribe even an approximate rule for fixing the length of hitch, because it is materially affected by the height of the team and the arrangement of the

harness, as well as by the condition of the road surface. Experience will soon teach the operator, however, when to shorten the hitch in order to lessen the amount of cutting done by the front runner and when to lengthen it in order to produce the opposite effect. When the road surface is sufficiently hard or the amount of material which it is desired to have the drag move is sufficient to warrant the operator standing upon the drag while it is in operation he can greatly facilitate its work by shifting his weight at proper times. For example, it is desired to have the drag discharge more rapidly, the operator should move toward the discharge end of the runners. This will decrease the ditch end of the runners to swing forward and thus increase the skew angle of the drag. The operator may, of course, produce the opposite effect by moving his weight in the opposite direction. In the same way, he can partially control the amount of cutting which the drag does by shifting his weight backward or forward, as the case may be.

When to Use the Drag

"It is fully as important that a road be dragged at the right time as it is that the dragging be properly done. The rule frequently cited, that all roads should be dragged immediately after every rain, is in many cases entirely impracticable and is also very misleading because of the conditions which it fails to contemplate. It is true that there are many road surfaces composed of earth or earthy material which do not become very muddy under traffic, even during long rainy seasons, and since such surfaces usually tend to harden very rapidly as soon as the weather clears up, it may be desirable to drag roads of this kind immediately after a rain. Such roads, however, would not ordinarily need to be dragged after every rain, because of the strong tendency that they naturally possess of holding their shape. On the other hand, many varieties of clay and soil tend to become very muddy under only light traffic after very moderate rains, and it is evident that roads constructed of such materials could not always be successfully dragged immediately after a rain. Sometimes, in fact, it may be necessary to wait until several consecutive clear days have elapsed after a long rainy spell before the road is sufficiently dried out to keep ruts from forming almost as rapidly as they can be filled by dragging. In many cases of this kind, however, it is possible greatly to improve the power of the road to resist the destructive action of traffic during rainy seasons by repeatedly dragging it at the proper time. Well constructed sand-clay and topsoil roads should not often become muddy after they are once well compacted. They may become seriously rutted, however, under heavy traffic, during rainy weather, and are almost sure to need dragging several times each year. Such roads should ordinarily be dragged as soon after a rain as practicable, as otherwise the surface soon becomes dry and hard, so that it is necessary to do considerably more dragging in order to fill the ruts. Furthermore, the material which the drag moves will not compact readily unless it contains a considerable amount of moisture. In general, it may be said that the best time to drag any type of road is when the material composing the surface contains sufficient moisture to compact readily after it has been moved by the drag and is not sufficiently wet for the traffic following the drag to produce mud."

State Road, Utah County

The following ten suggestions are given. If these suggestions are followed the result will soon manifest itself in better roads:

1. Inspect the road for its entire length during a rainy day and locate all holes, which will be easily noted as they will be filled with water.

2. Use the road drag immediately after a rain.

3. Fill all holes and depressions that cannot be evened up with the drag with good material, and then go over the section again with a drag.

4. Never put on the road any sod, sand or any material from the side ditches. Obtain fresh material of the same character as the balance of the road.

5. When the road surface is very rough, run a spiked tooth harrow over it while the road is still wet and this will very materially increase the efficiency of the drag.

6. In dragging the road, drag from the edges of the surfaced portion of the road toward the center. Be careful never to drag any material from the unsurfaced portion of the road on to the surfaced part.

7. Be sure after dragging the road that no ridge has been left between any portion of the road and the ditch. At times a one-horse cultivator can be used to advantage in removing the ridge that may have formed between the wheel rut and the ditch. The drag should be used immediately afterwards to bring the surface of the road back into shape.

8. Remove all glass, tin cans, nails, and rubbish of whatever character that may be found on the surface of the roadway.

9. See that all culverts are clear, with outlets and inlets in good order, and that the water can run freely in the ditches.

10. The old surface of the road must be cleaned and roughened before new material is added.

Too often the suggestions 3 and 4 above are not given proper attention. It is not possible to keep a road in good state of repairs by dragging only. Material wears out and must be replaced. Ordinarily from 200 to 300 cubic yards of gravel per mile per year should be added to the surface to keep it in a good state of preservation.

HIGH COST OF ENGINEERS JUSTIFIED

Now and then we hear someone complain about the high cost of engineers employed on our roads. A word or two of explanation might not be amiss.

In the first place, to have good roads —and good roads means modern roads— roads that will sustain modern traffic— it requires the services of good engineers. The old system of building a road by the winding route was scrapped long ago.

Today roads are built as straight as possible and over the shortest route possible between two given points. Modern traffic demands that they be built on easy grades. To get easy grades and good alignment necessitates the employment of engineers.

Engineers are the best protection the taxpayer has in getting his money's worth in roads. Thousands of dollars are saved the traveling public in reduced fuel costs on the roads now being constructed in this state.

Not every road that is surveyed is actually built. Sometimes it is necessary to make two or three surveys to find the cheapest and best route. Surveys are necessary to estimate costs. A prominent railroad chief engineer in his instructions to field men says that a survey intelligently made, but not used, is just as valuable to his road as one that is used.

The engineer is the agent of the people. He is on the job every minute from the time a project is started until it is finished, and sees to it that the people get their money's worth.—Colorado Highways.

Utah Highways

OFFICIAL MAGAZINE OF THE STATE ROAD COMMISSION OF UTAH

Volume 1 AUGUST, 1923 Number 1

STATE ROAD COMMISSION

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H. V. RICHARDS, Editor

GASOLINE TAX AND ROAD MAINTENANCE

With the state engaged in collecting a tax of two and a half cents on every gallon of gasoline sold and steadily accumulating a fund for maintenance of state roads, the question naturally arises in every county: "When will the state take over its roads and supervise and finance their maintenance "

Let us first consider when we may have not sufficient funds but any funds at all in the state treasury for manitenance. The operation of the new law will require the funding annually of the costs of former construction represented by our $7,000,000 in bond issues outstanding before the commission will have any funds placed at its disposal for present requirements. Since the maximum returns from the gas tax will be during the summer months and approximately one half of the total annual returns will be required to take care of the bond issues, we cannot expect to relieve the counties to any appreciable extent this year. In other words, most of the work accomplished in any one season will be financed largely from funds obtained during the preceding year. Better roads will mean decreased fuel consumption but they will also mean an increase in the amount of traffic, enough perhaps to offset the increased amount required for the bond fund beginning with 1925. On this basis we will assume that we will have $300,000 available every year for maintenance purposes. Allowing an average maintenance cost of $200 per mile on 3000 miles of state roads this will furnish just half enough to finance a conservative maintenance program.

The question then as to taking over the entire mileage for maintenance is readily answered: We cannot do it. The state and the counties will have to finance the roads on a fifty-fifty basis. Just how the problem will be handled,—what roads the state alone will maintain, if any, and whether adjustments of state aid will be made on the basis of mileage and population, or paid to the several counties in equal sums —is now under consideration.

STATE ROAD BOND ISSUES

A nation-wide effort is being made to keep up with the phenomenal increase in motor vehicles and the consequent growing demand for more and better roads.

According to the bureau of public roads the number of automobiles and trucks has increased from about 3,500,000 in 1916 to 12,238,375 at the end of 1922. It is estimated that the increase this year will approximate 2,400,000. It is evident that the road builders have their jobs cut out for them.

A large number of states are planning heavy bond issues to finance new construction, in a number they are already voted. For example, we read that in four southern states a quarter of a billion dollars will soon be available for road building and this without taking into consideration the heavy liabilities which the same people, in their county units, are assuming for the betterment of local roads.

We hear little objection to this plan of financing highway construction. In fact, big bond issues are so generally approved and in such high favor that to offer any criticism would be analogous to a voice crying in the wilderness.

In fact we have no fault to find with this method of payment, where a pay-as-you-go policy is inadequate to the public need. The evil lies rather in the manner of the expenditure of the funds that have been made available. There is one thing that the taxpayer, when he votes for the bonds, does not worry about. Whatever the amount of the issue, he can be sure of one thing: the money will speedily be gone.

There may have been instances where bonds were issued with a string tied to them: that construction will not exceed a stated amount in any one year and that no roads will be built without funds for their maintenance in sight; but if there have been any such they are certainly the grand exceptions. To the contrary we read that $9,000,000 will be spent in one state this year in the process of "cleaning up" a $15,000,000 issue.

The argument advanced by the states and "approved by the bureau" is this: If you want the roads you must pay for them, if you do without them you must pay anyway in greater fuel costs and tire upkeep. Undoubtedly the roads should be built, and with judicious speed but it appears in many instances that the highways we already have can still function if more attention is paid to their repair and more expensive improvement added in a program that will maintain the construction business on a reasonably normal basis.

If the bonds are not all sold at once, the state can hold out for favorable terms and sell them as the market offers the largest net returns. The interest piling up on unexpended funds can be kept at a minimum.

The anxiety to get rid of a large bond issue means hasty surveys, faulty alignment and ill-advised construction.

It has been advised that a state with a magnificent road-building fund at its disposal should limit its activities only by the available supply of labor and materials. But both labor and materials will cost more under these circumstances and the greater the amount of money in a community the less its value. There may be as keen competition for business among contractors when there is more work than they can handle as there is when the volume is kept down to approximately normal limits but the point is at least debatable.

We believe that the emphasis placed upon the emergency feature which is so generally noted as soon as the bonds are authorized sensibly increases the amount which the public has to pay for its roads and lessens the satisfaction with the results accomplished.

WHICH IS THE WISEST?

Which is the wisest plan, to build three miles of road of a type that will carry 95% of our traffic or build one mile of road that will carry all traffic It is stated and doubtless true that roads can be built that carry all passenger cars and light trucks for less than one-half the amount required to build roads of a type that will carry the heavy trucks and passenger cars.

It seems that if 95% of the motor traffic could be served by a light type of well drained and properly aligned road, kept up by a proper system of maintenance, that it would be a much wiser policy to build roads of this type and eliminate the heavy trucks entirely from these roads, in order that a greater number of people can be served and the interest safeguarded. Of course in some place where the traffic was unusually heavy and heavy trucks are essential, a road sufficient to carry the traffic should be constructed. A study of the motor traffic in Texas will enable the commission to know where the various types of roads are needed and by building the type of road needed for each community, with adequate funds and proper police power a greater number of people will be served and the cost of upkeep would be greatly reduced.—Texas Highway Bulletin.

LOOK OUT FOR THE STATE ROAD COPS

Among the enactments of the 1923 legislature was one providing that the commission shall have power to "employ such persons to patrol or police the state highways as may be deemed necessary in the judgment of the commission, such persons to be designated as patrols. It shall be the duty of the patrols to enforce the laws of the state and the rules of the commission governing the use of state highways, and to perform such other duties as may be required by the commission. For this purpose the members of the commission and the patrols shall be empowered to arrest, and hold

without warrant, any person whom the member of the commission or the patrol believes to be guilty of a violation of any act governing the use of state highways or the licensing or registration of motor vehicles, to hold a person so arrested until a warrant can be secured; provided, that the powers designated herein shall be exercised at the discretion of the commission."

No persons have as yet been designated whose sole duty it is to act as patrols, the commission has, however, designated such of its employes whose duties require their presence more or less upon the highways as state road police and issued appropriate badges. Such extension of the service will be made as experience shows to be advisable.

The state road police will aid the local authorities in protecting motorists from speed demons, glaring headlights, and other terrors of the road, discourage illegal loading of trucks and keep advertising along the highway within proper bounds.

It is thought that the use of state road police will tend to promote uniformity of road law enforcement, the lack of which is a cause of much complaint from tourists in most states.

Whether this public arm will be the forerunner of a state police force remains to be seen. Although the present force is empowered to enforce highway regulations only, an extension to include all state laws relative to public defense would appear, at first sight, reasonable, particularly in Utah where highways extend into regions remote from the usual civil protection.

The automobile is far from being an unmixed blessing to humanity; not only does it slay thousands annually in the hands of well-meaning but over-confident individuals, but it lends itself readily to the perpetration of crime and by its use the criminal can travel fast and travel far. It is not sufficient in this gasoline era to keep a wary eye on the railroad yards, in order to apprehend the evil-doer, every highway facilitates his arrival and offers a chance of escape.

ZION PARK-MT. CARMEL PROPOSED ROAD WILL CONNECT HIGHWAYS

The necessity for a connecting link in the extreme southern portion of Utah between Zion Park highway and the Grand Canyon highway in the vicinity of Zion Park has been apparent ever since the scenic wonders of southern Utah were discovered. This, however, appeared to be impossible within anything like a reasonable construction cost. The proposed road connecting these two highways with the west end at the entrance of Zion National Park and the east end in the vicinity of Mt. Carmel is twenty-five miles long, with a grade of 5% on about three miles of the project, and the remainder of the road with a grade not to exceed 3% in extreme cases. A tunnel through the rim of the canyon directly east of the park entrance will be necessary with a length somewhere between 1000 and 2000 feet; this point not being determinable within more definite limits until a preliminary survey of the proposed road is made.

The difficulties encountered when the Hurricane-Kanab connection was considered were that it crossed a sand country over a distance of approximately 75 miles between the points mentioned above, 45 miles of which is in Arizona; and owing to the fact that this Arizona connection would be a road used only by Utah travel, it is a serious problem as to whether Arizona would consider this construction to a type that would be necessary to withstand the travel required of it. The Zion Park-Mt. Carmel connection will eliminate all these difficulties. It will be a Utah road, probably constructed as a federal aid road and in connection with the National Park service. It will connect the three Utah scenic points now being exploited; that is—Cedar Breaks, Zion Park and Bryce Canyon, with a distance of 167 miles whereas, the necessary travel via Hurricane and Kanab to these three points will be 260 miles; and via the contemplated Rockville Bridge cutoff, a distance of 234 miles, thereby saving a distance of about 100 miles in traveling from Cedar Breaks to Zion National Park and thence to Bryce Canyon. It will also provide an economic commercial connection for Kanab with the railroad at Cedar City with an all-year route, as the summit between Zion Park and Mt. Carmel via this proposed road is 6500 feet elevation. As a scenic loop for tourist travel during the summer months from Cedar City over the Cedar Long Valley road to Bryce Canyon and returning via Zion National Park to Cedar City would be approximately 225 miles, a saving of approximately 130 miles over the road necessary to travel at present.

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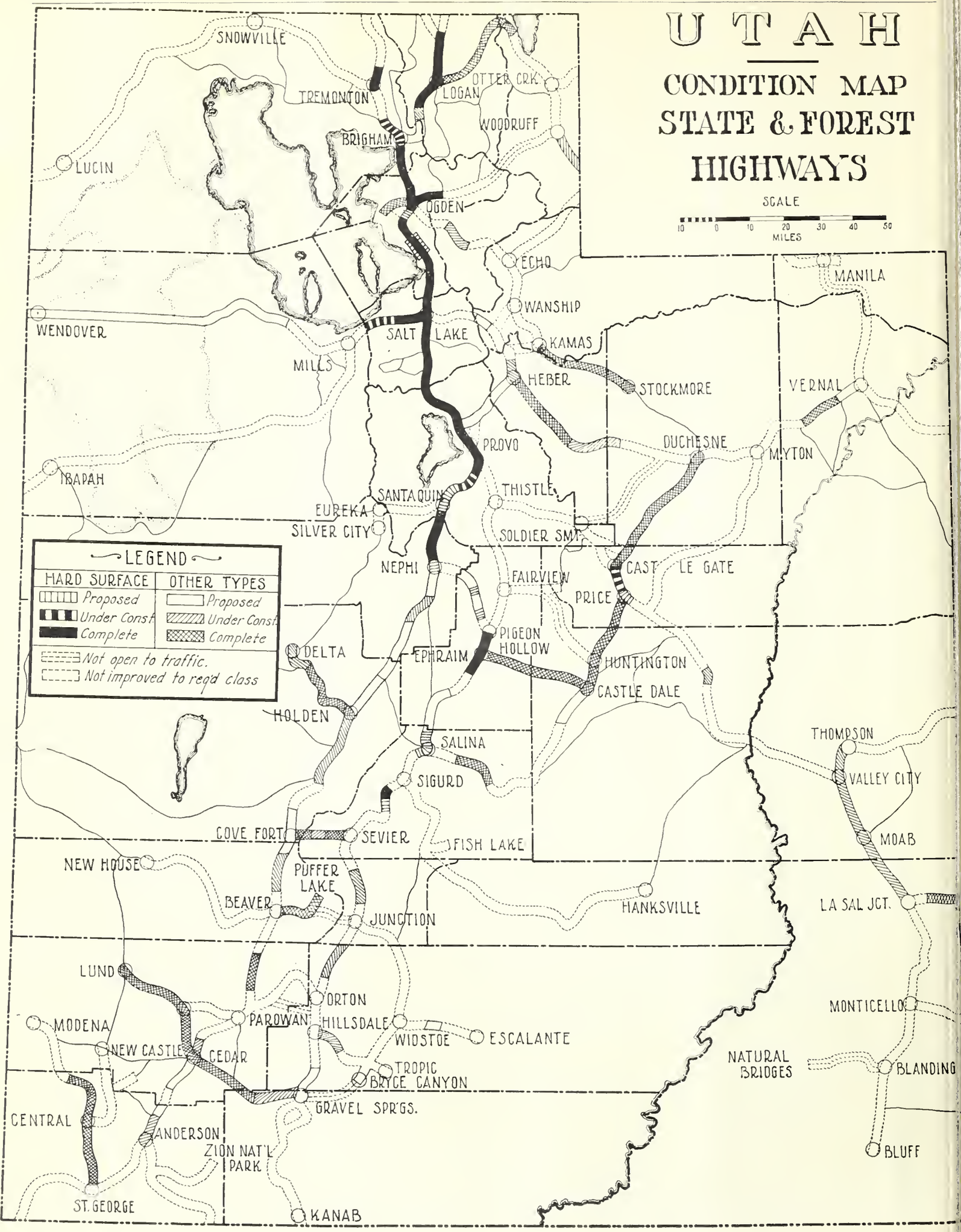
FOR RATES AND PARTICULARS


UTAH
CONDITION MAP
STATE & FOREST
HIGHWAYS
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HARD SURFACE
Proposed
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OTHER TYPES
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SNOWVILLE
TREMONTON
LOGAN
OTTER CRK.
WOODRUFF
BRIGHAM
LUCIN
OGDEN
ECHO
MANILA
WANSHIP
WENDOVER
SALT LAKE
KAMAS
MILLS
HEBER
STOCKMORE
VERNAL
PROVO
DUCHESNE
MYTON
IBAPAH
SANTAQUIN
THISTLE
EUREKA
SILVER CITY
SOLDIER SMT.
NEPHI
FAIRVIEW
CASTLE GATE
PRICE
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CASTLE DALE
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SALINA
THOMPSON
SIGURD
VALLEY CITY
COVE FORT
SEVIER
FISH LAKE
MOAB
NEW HOUSE
PUFFER LAKE
BEAVER
JUNCTION
HANKSVILLE
LA SAL JCT.
LUND
ORTON
MONTICELLO
MODENA
PAROWAN
HILLSDALE
WIDSTOE
ESCALANTE
NEW CASTLE
CEDAR
TROPIC
NATURAL BRIDGES
BLANDING
BRYCE CANYON
GRAVEL SPR'GS.
CENTRAL
ANDERSON
ZION NAT'L PARK
BLUFF
ST. GEORGE
KANAB

Standard Bridge and Culvert Designs Available For County Highway Officials Upon Request

BY MAURICE HOUSECROFT, Chief Bridge Draftsman

The bridge department of the state road commission has a number of plans prepared for several types and spans of bridges and culverts. The design loading used, however, may be somewhat heavier than that heretofore used by the counties, but in view of the ever increasing weight of our transportation vehicles and their loads, structures built to these standards will adequately care for all contemplated traffic for several years struction or design problems; in gen-

In the personnel of the state road commission are several engineers who have specialized on bridge design and construction, and the services and experience of these men are at the disposal of the counties whenever they have either construction or design problems; and in general the bridge department wishes to cooperate with the counties in all the varying phases encumbent upon the economical solution of effectively caring for highway structures, whether, in connection with design, construction, repair or strengthening.

Proposed plans will be gladly examined and changes suggested where modification is considered desirable; or existing structures will be examined and reported upon regarding necessary repairs or alterations.

Tabulated bids on bridge construction are available and from these the counties can formulate an idea regarding the current labor costs on this class of construction; or, an estimate of cost and materials involved will be prepared in very short time.

Standard designs are constantly being prepared. However, the plans now available consist of various spans of concrete girder bridges, I-Beam bridges with either wood or concrete decks, plate girder bridges, steel truss spans, concrete slab bridges, wood stringer and wood truss bridges, concrete box culverts for all sizes up to and including 12-foot clear span.

The subject of maintaining bridges is one which does not receive the serious attention which ought to be given to expensive construction of this nature. In particular the nuts on the vertical rods should be kept tight, otherwise the diagonal members do not function. This, in turn, overstresses other members and an eventual collapse is the only possible result. Rust is a very destructive and unsightly adornment to many of our steel bridges in the counties and the cost of a coat of paint occasionally would be amply refunded by the extended life of the structures. A few dollars spent in maintaining the river banks at the ends of wing walls with riprap would have saved many a good bridge from being washed out.

This technical service is one which can be taken advantage of by any of the county commissioners and the state road commission desires to call to their attention that such service is available upon request.

SIGNS DEFACE HIGHWAYS

In response to recommendations of the commission a law was passed at the last meeting of the legislature prohibiting bill board or other advertising medium to be placed within 300 feet of a public highway, except within corporate limits of towns or on land under private ownership without first receiving a permit therefor from the state road commission. This enlarges the powers of the commission in that it can remove signs which deface the highways or endanger traffic without requesting the action of local authorities.

An example of the lack of a saving sense of proportion on the part of advertisers was noted last summer when, along a scenic route in southern Utah, cliffs which bore hieroglyphics and other evidences of a prehistoric race, were painted over with quite modern symbols.

Other reasons covering the desirability of checking this evil are contained in the following bulletin from the headquarters of the American Automobile association:

> Protests against the defacement of highways by unsightly road sign billboards are being received at national headquarters of the American Automobile association almost daily. According to A. A. A. officials there seems to be a great and crying movement against the use of these billboards among the membership of the A. A. A. in every part of the country.
>
> All sorts of remedies for the abatement of this nuisance are suggested in these letters, from the enactment of suitable legislation to a refusal on the part of motorists to purchase any articles so advertised.
>
> In addition to the marring of highways, it is pointed, the billboard constitutes an absolute menace to the motorist by attracting his attention from the road ahead and often causing a more or less serious accident.
>
> "I believe that the road sign billboard should be abolished," said President George C. Diehl of the A. A. A. "These signs serve as a distinct menace to motorists, especially when they are placed, as many of them are, at a sharp curve, or a road intersection. A motorist driving along the highway and approaching such sharp curve or road intersection wants to see what is around that curve or down the intersecting road much more than he wants to see a huge sign advertising "Whooziz" tires or somebody's patent medicine or chewing gum.
>
> "The day of the billboard and the need of such methods of advertising is past. The class of people who use the highways and to whom such signs presumably appeal are a class that read the newspapers and magazines, and who are governed largely in their purchases by the advertisements of reliable products advertised in a reliable newspaper or magazine. It would appear to me that the intelligent advertiser would soon become aware of this fact and would transfer the money spent on billboards, which constitute an affront in the eyes of most intelligent citizens, to legitimate newspapers and magazines, where such advertising would have weight.
>
> "With the general trend of opposition to billboard advertising developing over the country, as is indicated by letters received at the A. A. A. headquarters, it can be but a question of time until the American public will take things into its own hands and find some means for the abatement of this nuisance."

Provo river bridge, F. A. P. 34-B

Resume of 1923 Laws Relating to Utah Highways

The needs of the road commission requiring legislative relief as set forth in the governor's address to the legislature, were fully discussed by the two houses and not a little constructive legislation was enacted. A further source of gratification from this action is felt by the commission in that it is apparent that the people, as expressed through their representatives, are behind the commission in its endeavor to build and maintain an adequate system of highways and willing to grant whatever aid is feasible to make possible a program of road improvement that will be a credit to the state.

The chief difficulty which the commission has encountered has been the lack of state funds for either construction or maintenance. A number of counties advanced sufficient funds to insure an uninterrupted construction program and prevent the reversion of federal aid through lack of local funds to insure its expenditure within the state. The costs of surveys, plans, estimates, etc., necessary to federal approval of a project have also been borne in each case by the county in which the improvement was contemplated.

The difficulties and objections to this system may be briefly summed up as follows: A county may be unable or unwilling to finance the improvement of a federal primary road where such improvement is of little consequence locally. Examples of this are the Lincoln Highway in Rich county, and in part in Summit county and the Victory Highway in Tooele county. The same objections to construction apply also to maintenance. It is the wish of the commission to assist the counties so far as possible in improving state roads to meet local requirements, but its relation to the state as a whole, and the federal bureau demand that first consideration be given to roads of state-wide importance, the secondary system and those are essential to interstate traffic, the primary system, and where these do not coincide with local needs the situation is sometimes unfortunate. This is peculiarly applicable to the question of maintenance, it being a provision of the federal law that the bureau of public roads may refuse to approve projects for construction in any state in which the maintenance is unsatisfactory on federal aid projects already completed.

It was to remedy this condition that the gasoline tax was passed by the legislature. An excise tax of two and one-half cents per gallon of motor fuel is now collected. The levy is made on the distributors, defined in the law as those who import motor fuel or who refine it in the state. This method of collection assures the largest net income possible from a tax of this description.

In adopting this source of revenue Utah has followed the lead of eighteen other states, while twelve others, in addition to Utah, were added to the list this year. Utah is the only state with a 2½ cent rate. Five states, however, have a higher rate than Utah.

The funds to be made available for road construction from this source are estimated as follows: Total annual consumption of motor fuel, 25,000,000 gallons, or 50,000 cars using an average of 500 gallons each. This estimate appears very conservative so we can safely disregard the items of cost of collection and figure net returns at $625,000. The automobile registration fees were cut in half by the last legislature which will reduce income from this source to about $365,000. The annual sum to meet sinking fund and interest charges on state road bonds is $675,000. The funds obtained from the registration tax will apply on this and the remainder will have to be made up from the gasoline tax, leaving about $300,000 to apply on construction and maintenance of state roads. Since the road bonds must be taken care of first we can expect but little to apply on road work this season. Interest and sinking fund charges on road bonds will continue at their total until 1925 when they increase to $737,500. They will remain at this figure until 1938 when they reduce to $547,500.

A state road revolving fund was also set up by the legislature in the amount of $181,000. The purpose of this fund is to enable the commission to meet expenses incurred in the construction of federal aid projects prior to the receipt of federal payments therefor.

While the government participates to the extent of 74% in labor and materials costs, and the engineering charges, payments are made only upon periodic certification of work performed and for materials actually placed, and no payments are made for superintendence and inspection until the project has been completed and approved. In the meantime the 26% of estimated costs paid in by the county prior to the beginning of construction may be nearly or quite exhausted, so in order that the contractor may be paid promptly each month and that the state may take care of its own payrolls on time it is planned to make payments from the revolving fund as need may require and replace with federal aid payments as these are received.

Legislative appropriations affecting highways are $50,000 to the state road contingent fund, which will be used to cover administration expenses during the biennium, $25,000 to apply on construction of the proposed Wendover road across the desert, and $15,000 for the construction of a road from Bluff to the San Juan county oil fields. This road is not a part of the state road system and will be built by San Juan county.

Other laws passed relate to advertising along highways and to state road police. These are discussed elsewhere in this issue.

Looking south towards Manti F. A. P. 29—Manti Temple on the left

RIVERDALE VIADUCT

At the last conference between representatives of the state, bureau of public roads and Union Pacific R. R. held in January, 1923, at the state capitol, to discuss plans for the proposed Riverdale viaduct, it was decided to change the type of approaches from concrete trestle to earth fill. This necessitated preparing an entirely new set of plans. These plans have been completed and at the present writing are being checked over by the bureau. The layout as it now stands, calls for a 144-ft. span steel truss bridge over the Weber river and a 128-ft. span steel truss bridge, together with a 20-in. I-Beam stringer span across the railroad right of way. On each end of the railroad crossing there is to be about 65 feet of open concrete trestle approach. All of the remaining approaches to both bridges are to be earth fill with temporary 6-inch, 18-foot gravel surfaced roadway. The gravel surface will be replaced later with a concrete pavement.

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Utah Highways

Vol. 1 September 1923 No. 2

"ANGEL'S LANDING," the subject of our cover this month, is in Zion canyon, a new national park of 76,800 acres in the eastern part of Washington county, reached by auto by way of the Zion Park highway, the Salt Lake-Southern California route, or by stage from the new railroad terminal at Cedar City. Zion canyon—the result of ages of sculpturing by the waters of Zion creek—is about twenty miles in length, with a series of pinnacles and domes of majestic height and sheer canyon walls, widening at intervals to include small valleys, and again contracting to narrow gorges of awe-inspiring depth—the whole beautifully tinted with colors ranging from white through many shades of red. Angels' Landing towers to a height of over 2000 feet and is colored throughout a deep red. The state and the National Park service are combining to improve the roads in this region to a high standard. The number of tourists visiting the park, which is open throughout the year, was 4500 from the first of the year to the end of August, a ten per cent greater number than the total for last year.

UTAH HIGHWAYS

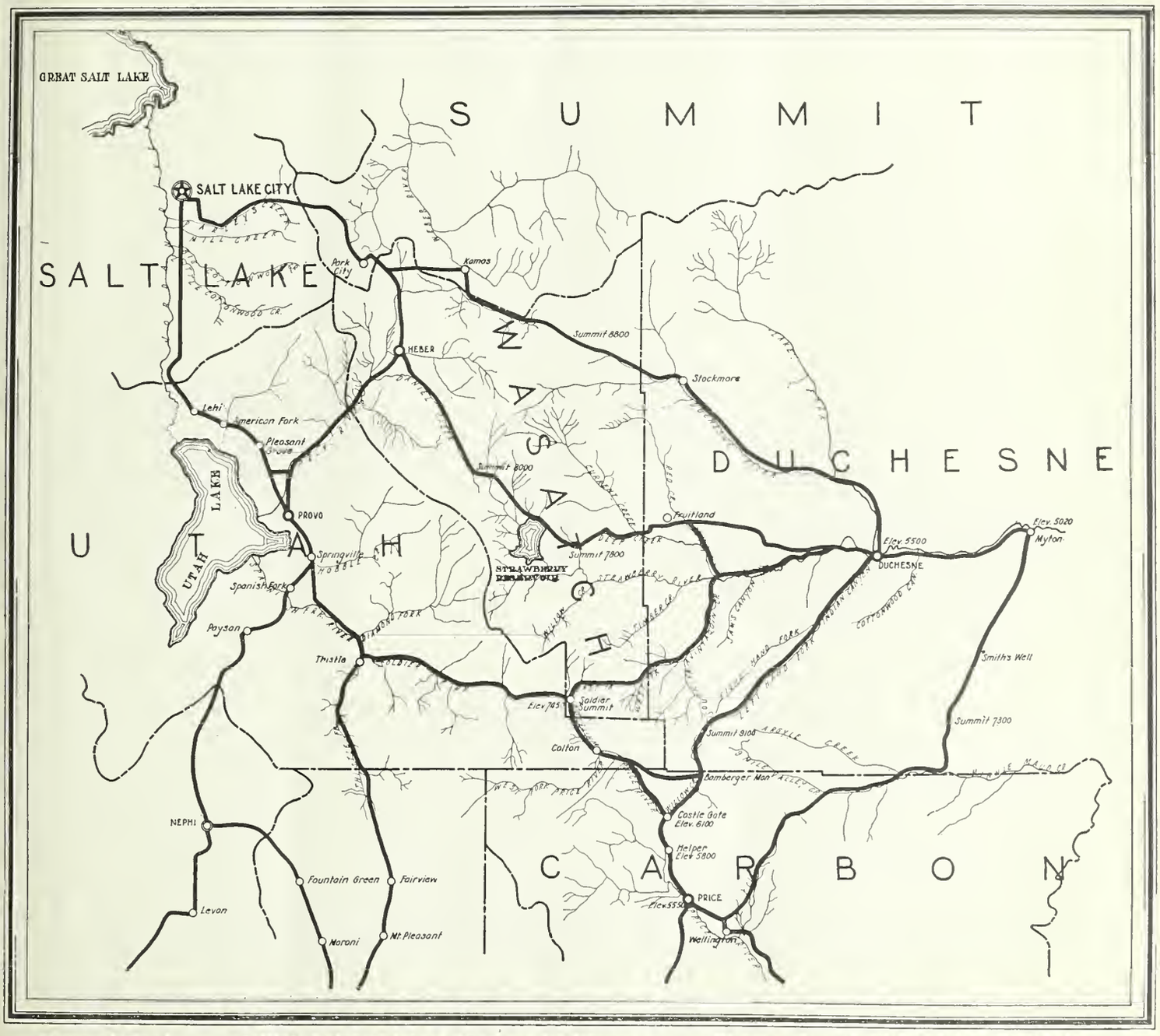
VOLUME 1. SEPTEMBER, 1923. NUMBER 2.

PROPOSED AVINTAQUIN ROUTE INTO UINTAH BASIN

By E. C. KNOWLTON, Assistant Engineer

The Uintah Basin is an empire in itself. It comprises a region 120 miles long, 70 miles wide, containing 5,376,000 acres, of which 500,000 are good, tillable, irrigable land. It has vast mineral deposits, mainly of the hydrocarbon family —oil-bearing shales, asphaltum and gilsonite, wholly undeveloped but so extensive that the present data available estimates their value at anywhere from five to ten billions of dollars.

From the point of view of transportation, nature has been most unkind to this great section of our state. It is shut in by great mountain ranges on all sides,



Name of Road	Initial Point	Point on R. R. and Distance		Distance from Initial Point to Salt Lake	
Price-Myton	Myton	Price	81.6 Miles	By way of Bamberger Monument	213.1 Miles
Duchesne-Castle Gate	Duchesne	Helper	49.0 Miles	By way of Bamberger Monument	148.3 Miles
Duchesne-Heber	Duchesne	Heber	74.6 Miles	By way of Dead Ox Flat and Park City	123.2 Miles
Duchesne-Heber	Duchesne	Heber	78.8 Miles	By way of Strawberry R., Red Ck., Park City	127.4 Miles
Duchese-Kamas	Duchesne	Park City	89.0 Miles	By way of Park City	118.8 Miles
Duchesne-Soldier Summit	Duchesne	Soldier Summit	49.4 Miles	By way of Springville	140.3 Miles

the continuity of which is only broken by the ingress and egress of the Green river on the north and south respectively, whose precipitous canyon walls offer no footing for a railroad or highway. On the east is the great Continental Divide rising to an elevation of 10,000 feet, on the west is the Wasatch range, the lowest crossing of which has an elevation of about 8000 feet, and to the southwest is the Book Cliff range, where the lowest road summit is at an elevation of more than 7000 feet. These natural barriers have stood thus far as the obstacles preventing the building of railroads into this section and to date, even though numerous railroad surveys have been run, prospects are not especially bright, at least for immediate railroad transportation. In the light of this condition the selection and improvement of highway routes, located so as to furnish the best possible highway transportation to this young and struggling section of our state, is the biggest problem before the state road officials today.

According to the Indian hieroglyphics in Nine Mile canyon, at least as interpreted by our good citizen, Carl Marcusson, of Price, the Price-Myton route was solemnly dedicated by the aborigines as the logical outlet of the basin. At any rate this road is the old standby and has been used as the basin gateway since the advent of the white man and his settlement of the Ashley valley and the Uintah Basin country. During the time that the western portion of the Basin was an Indian reservation with practically no settlement west of Myton this section was served well by this road, so far as its location as a feeder to the railroad was concerned. Its summit being lower than any other it is the road most practicable to keep open for travel during the winter season.

With the development of the Duchesne section of the country an area of nearly one-half of the total tillable acreage of the Basin lay west of Myton and this caused another route to be opened which taps the more westerly settlements at Duchesne, the western and logical outlet. This was the road to the railroad and Colton via Indian canyon, Willow creek and Emma Park. Subsequently the lower section of the Willow creek canyon was opened and Castle Gate, Helper and Price became the railroad points for this route. Notwithstanding the advantage the Castle Gate-Duchesne has, however, of entering the Basin at the proper place and reducing the distance to the railroad, its high summit of 9100 feet elevation with accompanying excessive heavy snow, presents a very serious obstacle, and nearly every winter the old standby, the Price-Myton route, has been called upon to furnish the winter outlet.

The Uintah Basin is traversed by a transcontinental highway and any discussion of the highways of this region must necessarily include the needs of interstate travel. By referring to the map it will be seen that the shortest possible route from Duchesne to Salt Lake City is by way of Stockmore, Kamas and Park City. However, due to the excessively high summit of this route and the fact that the section between Duchesne and Stockmore, a distance of 35 miles, is unimproved and almost impassable for automobiles, this route has had, up to date, no value for through traffic. It is doubtful if this road will ever play any part in serving the needs of the Basin save as a pleasure road during the summer months and for purely local traffic.

The next most favored highway from the standpoint of directness to Salt Lake City is that from Duchesne to Heber by way of Fruitland. At the present time this is the most popular summer route from the Basin to Salt Lake City. However, it has disadvantages in its long distance to the railroad and also due to the high elevation of the Strawberry valley, about 16 miles long and 8000 feet above sea level. This road has, to date, never been considered possible for travel during the winter.

Another route used between Duchesne and Salt Lake City is that of the Castle Gate-Duchesne road from Duchesne to the Bamberger monument and then by way of Emma Park-Soldier Summit and Springville to Salt Lake City. This includes the second route to be constructed out of the Basin, previously mentioned.

Selection of Route to Become a Part of Seven Per Cent System

With the law of November 9, 1921, the seven per cent federal system of highways was created. This law provides that seven per cent of the entire road mileage of each state may become a part of the federal highway system, with federal aid to be extended only to this system. Each state, through its state highway department, designates the roads it desires to have included in the seven per cent system and submits its selections to the secretary of agriculture, who may approve them wholly or in part.

In accordance with the law the state road commission some time ago submitted as a part of the above system a route from "K" Ranch, near the Colorado line, to Heber and by way of Duchesne and Fruitland. The secretary of agriculture in due course approved the selection from the "K" Ranch to Duchesne but did not approve that section between Duchesne and Heber.

In the meantime the state road commission saw fit to make an investigation of this entire problem to see which route from the Basin would be most satisfactory. During last winter a snow investigation was made of the entire region between Fruitland and the Bamberger monument, and since that time the problem in general has been given serious consideration in all its phases. With the facts at their disposal the commission recently selected a new route from Duchesne to Soldier Summit by way of Strawberry river and Avintaquin creek to Soldier Summit and has requested federal approval of this route as a part of the seven per cent system. The law required that the secretary of agriculture must submit the complete highway system in all the states to the coming session of congress so that it is presumed that the above route, selected and submitted by the commission will be acted upon by him before that time.

Relation of Heber-Fruitland-Duchesne Road to the Problem

As mentioned above, the secretary of agriculture has not approved the Heber-Fruitland-Duchesne route as part of the federal highway system. As a forest road, forest highway funds have been expended upon it and at the present time it is an improved road from Heber as far as Fruitland, leaving 27 miles to Duchesne, which is a passable road but badly in need of improvement. This 27 miles is known locally as the Dead Ox Flat section.

To build a road here of the standard demanded for a federal aid highway many engineering problems would have to be solved. It would have to be relocated entirely to get reasonable alignment and grade, using, however, the general route of the present road. A serious obstacle here is found in the fact that it is doubtful if surfacing gravel could be found within reasonable distance. If the Avintaquin route is selected it is certain that this Dead Ox section will be abandoned, and the portion of the Avintaquin route from Duchesne to the mouth of Red creek, a distance of 20 miles up Strawberry river, will become a part of the Heber-Duchesne road and the connection to Fruitland will be by way of Red Creek canyon. It is very likely that this Red creek connection would also be placed on the forest highway system and thus, even though the Heber-Duchesne road is not on the seven per cent system, it will be entirely improved as a forest road. This change on the Heber-Duchesne road will add perhaps four miles distance but the advantages gained in the way of watergrade, more favorable snow conditions and availability of surfacing material will more than offset this increased distance.

In my opinion this route was not approved by the secretary of agriculture for the following reasons: first, that Heber is not the logical railroad point for the Basin, and, second, that it has not been shown that it is possible to keep this road open for winter travel. Upon these grounds I believe there is no possibility for the Heber-Duchesne road to be the main highway out of the Uintah Basin. However, it has the great advantage in being the short distance route to Salt Lake City and when improved will always be a popular summer route if properly maintained. In weighing the advantages of the different routes as contenders for the main highway to the Basin, I shall not include the Heber-Duchesne road but will dismiss it upon the grounds above mentioned.

Characteristics of the Proper Route

In the consideration of this problem there are certain fundamentals to keep in mind, and the main one is that first and primarily the Uintah Basin is to be served with the best possible transportation regardless of where the outlet be and this issue must not be clouded by the question of the advantages or disadvantages to the interests of the different outlet points. Also it is apparent that only one route into the Basin can be placed on the seven per cent federal highway system. The ideal requirements for the route leading into the Basin might be stated by three cardinal points:

First. The route must furnish the best all the year around outlet to the railroad.

Second. Be a link in a direct all year highway to Salt Lake City.

Third. When a railroad is built over the Wasatch range into this country the

(Continued on Page 11)

1. Typical Gate Canyon scene, Price-Myton road, showing rugged topography. 2. Plowing through heavy drifts, Castle Gate-Duchesne road, March, 1923. 3. Confluence of Avintaquin and Red Creeks with the Strawberry; scene taken March, 1923. 4. Typical box canyon, Strawberry river, on proposed Avintaquin route, September, 1923. 5. Pulling mail through the "Klondyke" summit of Castle Gate-Duchesne road, March, 1923. 6. Looking east down Avintaquin Creek, showing typical wind-swept condition along proposed route, March, 1923. 7. Looking east, showing typical wind-swept condition in west fork of the Avintaquin. 8. Soldier Canyon section, Price-Myton road, September, 1923.

State Road Blocked by Floods in Northern Counties

By JOHN R. STEWART, Maintenance Engineer

It will not be necessary to go into details of the loss of life and property from flood in Box Elder and Davis counties following the storm of August 13. A violent electrical disturbance covering the region immediately east of the lake, and accompanied by a downpour in excess of any in the records of the local office of the weather bureau, sent enormous volumes of water and debris hurrying out of the sunbaked canyons near Farmington, Centerville and Willard.

It is the first flood of consequence in this region since it was settled, hence the vast quantities of huge boulders, mud and debris that were washed down the canyons in the path of the flood. The canyons near Farmington and Willard are grazed clean in the summer so there was almost no vegetation to impede the run-off or prevent slides of earth and rock. Boulders many tons in weight were piled with the mud ten feet deep in places on the state road, or went grinding and crashing through the villages with destructive effect. It is estimated that approximately a million cubic yards of rock and mud were carried out of the canyons, and that 25,000 yards were deposited upon the state road. In Davis county the flood came down four canyons in the Farmington and Centerville district and was confined to one canyon at Willard in Box Elder. In the former the devastation wrought was in kind but the amount of material deposited only about one-fourth that at Willard.

The problem presented to the state road commission and the county commissioners was, first to dig out a way for traffic as soon as possible and with the least inconvenience to the traveling public; and second, to restore the road and drainage to as near former conditions as possible.

The unfortunate situation which immediately arose was the fact that there was no detour available to carry the heavy traffic between Ogden and Salt Lake, and the difficulties incident to opening up such a road were so numerous that it was first decided that a strip through the flooded areas could be opened for one-way traffic as soon as it would be possible to establish detours. However, before one day had passed the nature of the deposit on the road and the insistent demands of traffic forced the abandonment of this plan, and detours were opened through fields and lanes, and with part-time use of railroad grade until the fourth day after the flood when the highway was opened sufficiently for traffic to get through.

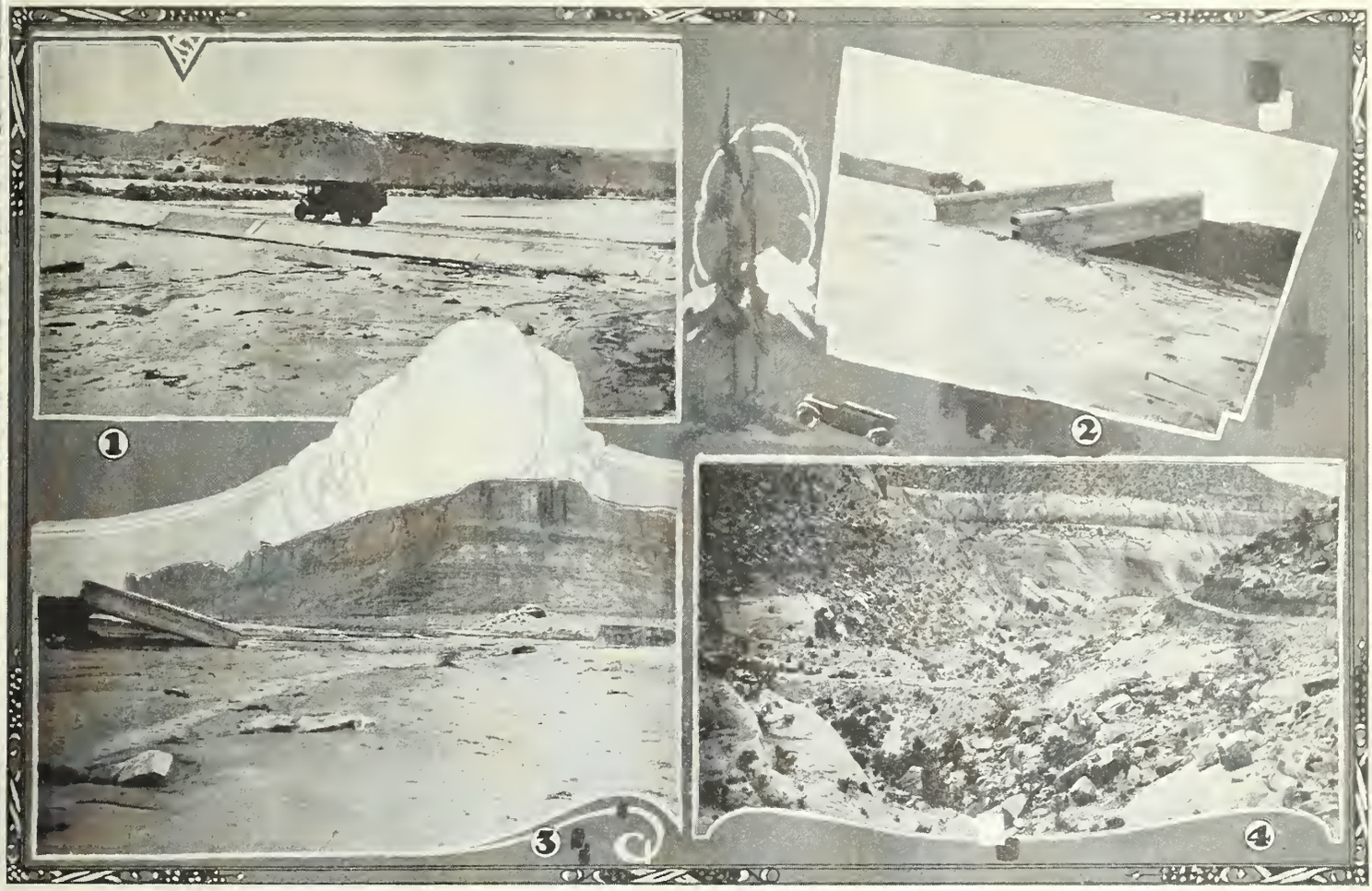
At Farmington a steam shovel and a caterpillar tractor, and at Willard two steam shovels, supplemented the work of scores of men and teams. It is worthy of note that the pavement has suffered no damage either from the heavy pounding of enormous masses of rock during the flood or from the operation of heavy machinery employed in excavation, and, so far as the concrete slab itself is concerned, the cost of placing the road in service is nil.

Realizing the importance of restoring the drainage conditions, surveys and estimates are being made for this work at Willard and Farmington. Farmington creek is completely filled for a distance of 3000 feet, there being a ridge to mark the location of the old channel; here it will be cheaper to construct a new channel. In Box Elder county the Willard creek channel is filled to a depth of from 3 to 15 feet. Where the highway crosses this stream the waterway was about 24 feet wide and 12 feet deep and at this point the channel was completely filled and the pavement covered to a depth of several feet, so that here it will be necessary to excavate a twentyfoot strip to a total depth of 16 feet for a considerable distance either side of the road in order to safely carry the ordinary run-off from spring thaws and storms.

The reconstruction of the waterways in the devastated areas presents an engineering problem of magnitude. Its solution is essential for the protection of the communities involved, and for irrigation, as well as for the proper drainage of the roadway.

The cost of clearing the road has been divided equally between the state and the counties, the state road commission using its revolving fund for that purpose, and it is desired to ask the next legislative assembly for an appropriation to cover the total cost. The problem of distribution of funds required for the construction of drainage channels has not yet been worked out.

Above-Roadway partially opened, Below-Fields destroyed,



1. Submerged bridge, Court House Wash, intact after first flood. 2. Flood waters at Seven Mile Wash bridge. 3. Same—Flood water receding, showing abutment and embankment washed out. 4. "Kane Springs Dugway" showing typical topography.

Summer Floods in Southeastern Utah

By H. S. KERR, Assistant Chief Engineer

That portion of Utah east of the Wasatch mountains and south of the Book Cliffs, drained by the Colorado river and tributaries, has presented a number of problems to highway engineers, similar conditions probably not being encountered elsewhere—the result of most unusual topographic features and the heavy run-offs after summer storms.

The dry washes so numerous throughout this section carry streams two or three times greater than would be estimated by any engineers without experience in this particular section. This on account of the fact that there are heavy storms during the period from the middle of July to the middle of September and that the sand washes include within their drainage areas large tracts of bare sandstone resulting in a 100% run-off and a much greater percentage of run-off for the balance of the drainage area than is usual elsewhere on account of lack of vegetation in the valleys and over-grazing in the mountains.

This large area contains but a small percentage of land that has to date been reclaimed by irrigation and while portions can successfully be farmed without irrigation such portions are too remote from existing railways to be the success that otherwise would apply. The population therefore is very scanty, same being, eliminating the occasional coal mining camps, about one person to each three square miles of territory. There are large areas eroded to a marked extent, on account of the prevailing soft sandstones, shales and marls. From a scenic standpoint this weirdly fantastic topography results in views not to be duplicated anywhere else, except in adjoining similar sections of Colorado and Arizona. The wonderful canyons, natural bridges and escarpments, together with the cliff dwellers' ruins, are attracting more and more attention each year, since first being called to the public's notice but a few years ago. And in consequence the limited population referred to are having their efforts for better roads supplemented by the efforts of tourists who have visited some portions of this interesting section; also the transportation companies whose lines can be used in connection with automobiles to reach this section.

The financial resources of the counties embraced within the area referred to, however, makes highway construction progress slow particularly as maintenance costs are excessive on account of the annual flood damage.

It is regarding a typical case of flood damage last month that the writer has been requested to give some information for this issue of Utah Highways.

The accompanying photographs show structures at "Seven Mile Wash" and "Court House Wash" about midway between Thompson and Moab, Grand county, Utah, Project F. A. P. 5.

The former was a first-class structure having a clear span of 28 feet and height above bed of wash of 6 feet, the capacity being 840 second feet. The particularly heavy run-off, early in August of this year, was about 6000 second feet. The photographs show the damage done to this structure and the flood several hours after the maximum flow, when same was about 2000 second feet.

The same heavy rainfall that caused this run-off down Seven Mile Wash and the failure of the structures there resulting in a flood at "Court House Wash" heavier than any for a number of years past, the estimated flow being 10,500 second feet. At this point there was a submerged bridge and the accompanying photograph shows same after the flood. It was noted at that time by the writer that a cut-off was required at the end wall of the O. G. and he so reported.

Another and even larger flood occurred a few days later, however, and this submerged bridge was badly damaged. While the structure failed, the extraordinary floods of last month have demonstrated that where conditions make it possible anywhere in the section referred to, except for the crossings of dry washes where the channel is more than adequate to take care of past flood run-offs, that submerged bridges should be standard construction.

Road Improvement in Iron County

In November, 1922, Section B of the Lund-Cedar City road was completed, marking the conclusion of 33 miles of gravel road construction.

The road extends from Lund, on the main line of the Los Angeles & Salt Lake railway, to Cedar City and the Zion Park highway. From Lund the road extends easterly for 20 miles through a desert region of shifting sand which presented many difficulties in the construction of a suitable subgrade and necessitated very long hauls in placing the surfacing material. Melting snows following the first construction season caused the subgrade to break down over several miles of new embankment, due to the poor quality of materials available for its construction—a condition which was overcome by raising the grade and covering with an impervious clay capping, which, with the addition of gravel surfacing, has enabled the road to bear traffic continuously in spite of trying extremes of drought and flood.

Upon the completion of this road the county provided for its constant inspection and repair by patrols, this being the beginning of maintenance by patrols in Utah, and it has proved so eminently satisfactory that its adoption is rapidly extending throughout the state.

Another road improved recently in Iron county is the Buckhorn Flat portion of the Zion Park highway, Federal Aid Project No. 15, gravel surface. On the same highway and immediately north of Cedar City, a 75-foot steel truss bridge is being constructed across Coal creek.

A number of surveys are now in progress in this southern county with the view of further highway improvement. These, as well as the work accomplished, are discussed in the following article contributed by Mr. H. L. Adams to the Iron County Record and appended here as indicative of the attitude of the local citizens toward these road-building activities:

Accomplishments

"The campaign for road building in Iron county has grown in a very short period to such an extent that at the present time no sane person looking back over the past four years will have any doubt that in the very near future Iron county will have a network of properly built and maintained roads that will be one of the vital factors in the development of this commonwealth.

"By means of state and federal aid we were able to construct the Cedar-Lund highway and place it under proper maintenance. It is considered today one of the best built and patrolled gravel roads in the western states. The construction costs were divided over most of the project at the rate of federal aid 50%; state aid 30% and county, 20%.

"The Buckhorn Flat road of 9.5 miles, which is just finished, is another federal aid project, in this instance the government contributing 74% and the county 26% of the cost. It is another paying investment and one of the best roads in the west.

"The Coal Creek bridge, now nearing completion, is a splendid structure which has long been needed. This is also a 74-26 federal aid project.

"Iron county is among the pioneers in adopting the patrol system in Utah, a method where competent men are taught how to keep the roads in first-class condition and are paid according to their efficiency, and not with the idea of giving every one a chance by changing every few days as with the old system.

Growth of Public Spirit

"The good roads movement has grown in this county until nearly every town has voluntarily graded and capped the road through it or in its vicinity. A good example of this is the construction of the road up Parowan canyon to Cedar Breaks by the citizens of Parowan, remuneration for one-third of the cost of the work being received. Another is raising of funds by the people of Cedar City to match the amount given by the federal government in the reconstruction of the Cedar-Long Valley highway, a national forest road, which had been washed out by a flood, making it possible in these instances to put these roads in good traveling condition—two splendid roads reaching the scenic wonders of the county and also tapping the vast timber areas and mineral deposits. To one traveling these roads it is amazing to see the size of the loads of logs and lumber being hauled down and in the words of the teamsters it is not "how much our horses can pull, but how much our wagons can hold up."

Building for the Future

"In cooperating with the state and the federal bureau of roads we are building for the future; in the first place roads

(Continued on Page 12)

1. Concrete road roller on Buckhorn Flat F. A. P. No. 15. 9.5 miles gravel surface. 2. Lund-Cedar City road, looking west from Cedar City, F. A. P. No. 11, 33.3 miles gravel surface. 3. Constructing abutments for 75-foot steel truss over Coal Creek at Cedar City, F. A.P. No. 48.

Construction of the Wendover Highway

By HOWARD C. MEANS, Chief Engineer State Road Commission of Utah

The conditions encountered in the construction of a portion of the highway that leads west from Salt Lake to San Francisco are very interesting from an engineering point of view, and are peculiar to this particular section.

West of the lake the road enters the Great Salt Lake desert and parallels the tracks of the Western Pacific railroad on a forty-mile tangent to Wendover on the Nevada state line. For eight miles of this distance the road traverses a bed of solid salt, approximately four feet in depth, the residuum from the subsidence of an ancient lake. The town of Salduro, where extensive salt works are in operation, is located near the center of the salt flats. The salt bed is underlaid with a clay stratum of indefinite depth, a well driven to a depth of 500 feet disclosing the same clay formation throughout. The problem of how to remove the salt covering, or whether it is necessary to remove it in the construction of the road is a matter that has given the department subject for study. During the spring months water accumulates on the salt to a depth of a foot or more, making it necessary to have a continuous fill about three feet high over the eight-mile stretch.

The procedure of the railroad in raising an embankment over this section was to haul material from the vicinity of Wendover about six miles west of the west edge of the salt beds. The excessive cost of this method has led the department to adopt a plan based upon the experience of the Salduro company in building dikes for use in harvesting the salt crop.

Material for construction of the roadway will be obtained by cutting through the salt and excavating the underlying clay by means of a trenching machine. This will cut a trench about three feet wide and twelve feet deep. It is estimated that four such cuts will be required to obtain sufficient material for the compacted fill, making the first cut about twenty-five feet north of the center line of the roadway and continuing with parallel cuts on the north with about 10-foot intervals in order to allow sufficient bearing for the trencher which has a weight of fifty tons.

The finished roadway will have a width of 24 feet across the top with a 6:1 graveled slope on the north side, as a protection from wave action. To the south the road will be protected by the railroad embankment, but on the north the wind and waves will have an unimpeded sweep for many miles. The road will be surfaced with gravel.

It is planned to conduct the trenching operation in the following manner: Beginning with the first trench on the north, remove the salt covering and deposit it along the north side and immediately adjoining the trench. Then excavate the clay from this trench to the maximum depth as determined by the capacity of the trencher, deposit on the roadway, and with a grader scrape the salt back into the trench. For the second trench the salt will be removed and the clay placed in the embankment in the same manner except that the salt will be deposited immediately in the first trench. The third and fourth trenches will be handled in like manner, the first trench located near the toe of the slope of the finished embankment being then entirely filled with salt. The clay will then be leveled and shaped for the roadway. It will be necessary to allow some time for this material to dry out sufficiently to handle with graders and other equipment preparatory to placing the gravel surfacing.

Gravel surfacing will be delivered by the railroad along the right-of-way and hauled or conveyed in some manner over the intervening distance, about 100 feet to the roadway, after which it will be shaped, rolled and bound for traffic.

Thirty miles of the remainder of the 40-mile tangent lie across mud flats, where the necessary fill will be made by drag line, presenting a comparatively simple problem of construction.

The construction of this road will greatly advance the completion of an adequate highway between Salt Lake and San Francisco, the Utah desert having always presented the most serious obstacle to a safe and direct route.

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Utah Highways

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H. V. RICHARDS, Editor

TWO-STAGE CONSTRUCTION OF PAVED ROADS

A number of projects, proposed or now under construction, on trunk-line state roads will include the placing of gravel for the surfacing strip over the improved section. The location, and the design of the roadway and structures contemplate the addition, when the traffic needs require, of a hard-surface pavement.

The object, then, of two-stage construction is to improve the existing roadway and provide a suitable subgrade for future hard surfacing; the preliminary stage being the construction of a gravel surfaced road including the improved drainage, grade and alignment requisite for the pavement foundation, the second stage the construction of the pavement when traffic needs justify the additional expense.

It is axiomatic that whatever is worth doing is worth doing well, and it is natural that a community should desire, when a road begins to break down under traffic, to replace it with the best that can be obtained—to go at once from dust and mud holes, unsafe timber structures and broken-backed vertical curves, to permanent structures, sightly alignment, easy grades and a smooth, easy-riding pavement. That is, from a more or less passable road to an ideal road.

Of course where traffic needs justify, a pavement should be laid, but the fact should not be lost sight of that with two-stage construction many of the improvements desired are gained and, comparatively, with much less time and expense. Adequate and permanent drainage structures can be had, easy grades with balanced cuts and fills and a pleasing alignment can be had, all at an average cost, in open country, of about $4000 per mile—two-course gravel surfacing 18 feet wide will cost another $4000. That is, a road with a well-packed gravel surface and in every way suitable for a paving base with very little additional cost can be built for $8000. Grading and paving with concrete 6 inches thick, 18 feet wide, will cost about $32,000 per mile; $4000 for the grading and structures and $28,000 for the pavement. Four miles of gravel surfaced road can be built for one of pavement and the cost of concrete surfacing is seven times that of gravel surfacing. At five per cent the difference between interest charges for the two types of construction is $1200 annually, three times the cost of effective maintenance of the gravel road by the patrol system.

By the use of two-stage construction the federal aid funds available can be extended to include much needed road improvement and a well-constructed gravel road will form an ideal base for a pavement when the traffic needs require a higher type of surfacing.

ADDITIONAL HIGHWAYS IN FEDERAL AID SYSTEM

The 1921 amendment to the federal aid road act requires the secretary of agriculture to publish a map, prior to November 9, 1923, showing the 7% highway system in all the states. Since 329 miles remain to be approved for inclusion in the 7% system in Utah, to bring the total to the 1684 miles allowed by law, a conference was held August 20 by the Commission with officials from the district office of the federal bureau and it was decided to submit the following roads to the secretary of agriculture for his approval:

From Tremonton to the Idaho state line via Portage.

From Soldier Summit to Duchesne via Avintaquin Canyon.

From Valley City via Monticello to the Colorado state line.

From Thistle via Spring City to Chester.

From Anderson's Ranch via Mount Carmel to the Arizona state line.

From Rockville to the Arizona state line.

The Avintaquin Canyon route will involve new construction throughout and the desirability of its inclusion is discussed elsewhere in this issue.

The Anderson's Ranch-Mount Carmel road will also require the location of about 25 miles of new highway and will involve the construction of a tunnel 1000 feet long or more. The relation of this highway to the existing state road system, its economic importance, as well as its advantages in touring the scenic sections of southern Utah, were detailed in the August issue of "Utah Highways."

GRAVEL ROADS

The growing popularity of gravel roads in Utah, constructed to federal standards, is shown by the following figures, showing mileage constructed or proposed over a four-year period:

Year	Miles
1921	34
1922	42
1923 (program)	143
1924 (program)	200

Thirty-five per cent of the highways in the United States on the federal aid system are gravel roads. The experience gained through such extensive construction and use of this type of road has naturally led to improvement in methods and in the materials employed. Up to and during a part of the season of 1921 gravel passing a three-inch screen could be used as a part of the base course; on Utah state roads this has been cut down by successive gradations as experience demonstrates the superior binding qualities of smaller particles of gravel until the maximum size now permitted in the base course is 1½ inch. The top or wearing course has undergone similar modifications during the same intervals from "Passing a 2-inch screen not less than 95%" as we read in the old specifications, to 100% passing a one-inch screen and not less than 25% retained on a ¼-inch screen.

Construction under the latest specifications will mean that much of the gravel used for surfacing will require crushing—more expensive—but highly desirable from the point of view of increased wearing qualities, the dust and fines resulting from the crushing operation furnishing binder of a high quality. The theory of the gravel road is, in effect, the same as that of concrete, the greater the adhesion in the binding material the greater the resistance of the road to abrasion—a "clay-concrete',' so to speak.

Other improvements relate to placing the gravel to facilitate distribution of sizes, and sprinkling, is specified as required to assist the rolling operation to secure a thorough compaction of the gravel courses. The "feather-edge" type of section has been changed to a uniform depth for the entire strip and shoulders are required to be formed to hold the surfacing in place before any gravel is spread.

"The National Sand and Gravel Bulletin" in the course of a survey of gravel road construction throughout the country makes the following observations in regard to gravel road construction and maintenance:

"If the gravel road has in some parts of the country lost favor with the motorist, it is not the fault of the material but of the man who designed and built the road, for a properly constructed and efficiently maintained gravel road will care for a traffic under 500 vehicles per day, just as well as pavement and at one-fourth the cost.

* * * * * * *

"Last, but not least, put the maintenance man to work the day after the contractor is paid off. This is important. Maintenance means TO MAINTAIN—not to repair. Give each man about eight miles of road, equip him with a small truck with a blade grader to hitch behind, and make him responsible for that piece of road and FOR NOTHING ELSE. Don't expect that man to do a dozen other things. On the contrary, furnish him extra help for extraordinary repairs in the spring."

Status of Federal Aid Projects

UNDER CONSTRUCTION AUGUST 31, 1923

No.	County	Name	Type	Length	Per Cent Complete	Contractor
5-ABC	Grand	Thompson-Moab	Graded Earth	37.79	95	J. J. Coan-Clark & Bush
6-ABC	Grand-San Juan	Moab-LaSal Junction	Graded Earth	23.25	92	Hyde & Black
9A	Millard	Delta-Holden	Gravel Surface	10.61	90	Johnson, Gillespie & Adamson
9-G	Millard	Holden-Kanosh	Gravel Surface	5.14	90	Johnson & Badger
9-H	Millard	do	Gravel Surface	5.75	90	Mathews, Barrus & Wrathall
9-J	Millard	do	Gravel Surface	7.80	87	Meadow Const. Co.
9-K	Millard	do	Gravel Surface	4.98	90	George & Bird
12-A	Washington	Ash Creek-Andersons Ranch	Gravel Surface	7.30	55	McArthur, Winsor & Whitehead
12-B	Washington	Ash Creek-Andersons Ranch	Bridges—Concrete	.....	70	Snow, Cannon & Kemp
17-C	Juab	Levan-Chicken Creek Dam	Gravel Surface	9.04	76	Paxton, Dorrity & Black
19-A	Piute	Marysvale-Junction	Gravel Surface	12.56	99	A. G. Young & Co.
33	Cache	Sardine Canyon	Gravel Surface	6.96	45	Olof Nelson
38-A	Box Elder	Brigham-Corinne	Concrete	4.0	99	Gibbons & Reed
39	Salt Lake	Magna-Tooele Co. Line	Concrete	6.41	48	Moran Paving Co.
41	Morgan	Morgan-Peterson	Gravel Surface	7.8	69	Western Engr. & Const. Co.
42-A	Wasach	Heber-Hailstone	Gravel Surface	7.46	40	Gilkerson Const. Co.
42-B	Wasach	Heber-Hailstone Bridge	Steel Truss	.....	90	Christensen, Jacob & Gardner
43	Sevier	Richfield South	Concrete	1.5	....	Gray & Murdock
44	Sevier	Salina City	Concrete	1.5	....	Gray & Murdock
45	Emery	Woodside Bridge	Steel Truss	.....	63	Security Bridge Co.
46	Rich	Woodruff-Wyoming	Gravel Surface	7.4	38	Kroft & Bundy
47-A	Sanpete	Moroni City	Concrete	1.0	11.5	Reynolds-Ely Const. Co.
47-B	Sanpete	Moroni-Fountain Green	Gravel Surface	7.09	15.8	Reynolds-Ely Const. Co.
47-C	Sanpete	Fountain Green	Concrete	1.0	....	Reynolds-Ely Const. Co.
47-D	Sanpete	Fountain Green-Juab Co. Line	Gravel Surface	5.33	4.6	Reynolds-Ely Const. Co.
48	Iron	Coal Creek Bridge	Steel Truss	.....	99	Security Bridge Co.
49	Summit	Gogorza-Salt Lake Co. Line	Gravel Surface	3.06	20	Moss, Snarr & Thayne
52	Sevier	Richfield South	Concrete	1.5	3	Gray & Murdock
		CONTRACTS LET DURING AUGUST				
4-F	Emery	Castle Dale-Ferron	Gravel	11.5	....	J. T. Raleigh Co.
10-B	Uintah	Ft. Duchesne-Vernal	Gravel	5.2	....	A. G. Young & Co.
10-B	Uintah	Ft. Duchesne-Vernal	Bridges—Wooden	.....	....	Caldwell, Batty & Eaton
17-A	Millard	Scipio-Juab	Gravel	7.08	....	Hawley, Anderson & Hinckley
53	Juab	Nephi City	Concrete	1.77	....	Wasatch Grading Co.

Projects for Which Plans Have Been Submitted

F. A. P. 17-B.

Chicken Creek-Millard; Juab county; 15.0 miles gravel. Plans on this project were completed and sent to the bureau in July. Since then two major line changes have been decided upon involving a saving in distance of approximately one mile. A field party has completed the survey of these changes and the plans will be revised and resubmitted to the bureau.

F. A. P. 24-C.

Price-Underpass and Price City paving; 1.125 miles concrete. Bids on this project were received August 11. The Utah Concrete & Stucco company were the low bidders. The commission could not let the contract on this work, however, until the right of way and railroad participation situations were cleared up. The county has signed an agreement for the necessary right of way with the Denver & Rio Grande railroad. The hearing before the public utilities commission to determine the amount of railroad participation in the Underpass structure has been postponed several times at the request of the railroad. Until a decision is reached on this matter and approval is given on the right of way agreement by the federal bureau, no construction work can be done on this project.

F. A. P. 31.

Riverdale Overhead Crossing; Weber county; 0.5 mile. Plans for the railroad's portion of this project have been approved by the district office of the bureau of public roads with minor corrections. Plans for the highway portion have been submitted to the bureau and are being reviewed at their regional office at the present. As soon as approval is given it is hoped that some work can be done on this project this fall.

F. A. P. 50.

Payson-Juab Co. Line; 8.56 miles hard surface. Plans for this project were submitted to the bureau of public roads in July and approval will very likely be given within a short time. If the right of way through Payson and near Spring Lake is obtained by Utah county, this project will be ready for advertising for bids and some of the grading completed this fall.

F. A. P. 51.

Timpie-Wendover, Tooele county; 74.2 miles gravel. Plans for Section "A" of this project, which extends from Knolls to Wendover, 39.5 miles, have been submitted to the bureau of public roads for review. Approval has been given to let the contract for the grading of the "Salt Section" of the above project, which is a six-mile section across the salt beds near Salduro. The remainder of Section "A" will be advertised for bids as soon as approval is given by the federal government.

F. A. P. 56.

Redmond-Sanpete, Sevier county; 2.13 miles gravel surface. Plans on this project were submitted to the bureau of public roads last month. It is planned to advertise it, together with Project No. 57, so the date of opening of bids will be controlled by the latter project.

Plans in Course of Preparation

F. A. P. 54.

Cedar-Kanarra, Iron county; 11.0 miles gravel. The location of this project was recently completed by Mr. G. A. Gregory, locating engineer. The plans are about 90% complete and every effort will be made to rush this project so that construction can be started this winter.

F. A. P. 55.

"Black Ridge" 4.3 miles gravel surface in Washington county. This project will consist of the grading of what is now known as the "Black Dugway" which is a very steep and dangerous section. It is planned to widen this to standard width and reduce the grade to a 5% maximum and surface with gravel. Every effort will be made to rush this project so that some construction may be started this winter.

F. A. P. 57.

Gunnison-Sevier; Sanpete county; 10.37 miles graved and hard surface. Plans for this project are practically completed and will go to the bureau of public roads for review within a few days. It is hoped that approval will be given

soon enough that this project, together with Project No. 56, may be advertised and contract let in time to permit of the reconstruction of the worst section of this road this fall.

F. A. P. 59.

Layton-Clearfield; Davis county; 4.11 miles of resurfacing and widening of present 16-foot concrete road. Plans of this project are 80% complete and call for the resurfacing with concrete or bituminous concrete and the widening to 20 feet of this road. It is not planned to do any construction this year.

Projects for Which Surveys have been Completed

F. A. P. 58.

Cache-Mantua; 4.14 miles gravel; Box Elder county. The survey for this project was recently completed by Mr. K. C. Wright. The project as surveyed extends from the Cache county line into Mantua. There is some controversy with the bureau of public roads as to the location in Mantua. A project statement has been submitted to the federal government covering this location. The plans will be completed this winter so that construction can start early in the spring.

F. A. P. 60.

Echo-Emery; 11.0 miles gravel; Summit county. The location survey of this project was recently completed by Mr. Jos. M. Tracy. This location eliminates seven grade crossings and will include the construction of one underpass. A joint conference is planned between railroad, government and state representatives to endeavor to work out some plan for financing this work.

F. A. P. 65.

Orem-Wasatch Co. Line via Provo Canyon; 9.5 miles gravel. The location survey of this project was recently completed by Mr. Wendelboe, locating engineer. Two alternate lines were run—one on the north and the other on the south side of the canyon. The plans and estimates will not be worked up until further investigations are made with the bureau engineers to determine which line is the best suited to meet all conditions of grade, alignment and snow conditions.

Surveys Now Being Made

F. A. P. 61, 62, 63, 64.

Sevier county. These will be four federal aid projects of gravel surface construction. It is proposed that Project 61 will extend from Salina to Aurora, a distance of approximately 4 miles. Project 62 will extend from Aurora to Sigurd, a distance of 7 miles. Project 63 from Sigurd to the north end of the present Richfield pavement, a distance of approximately 6½ miles; Project 64, from the south end of F. A. P. 43 (contract for which was recently awarded) to Elsinore, a distance of about 4½ miles. The location is under the direction of Mr. Carl A. Erikson and an effort will be made to let one of these projects this fall in order to furnish employment during the winter if weather conditions are favorable.

F. A. P. 66.

Parowan-Winn Hollow; 6.0 miles gravel; Iron county. The survey of this project is about 90% complete. Mr. G. A. Gregory is in charge of this work. This road is an important link in the main state road north of Cedar City.

F. A. P. 67.

Scipio-Holden; Millard county; 12.0 miles gravel. This project connects up with the two federal aid Projects Nos. 17 and 9. The location is about 75% complete.

Proposed New Work

F. A. P. 68.

Dog Valley-Beaver; Millard county; 8 miles gravel. The location survey on this project has not started.

F. A. P. 69.

Wild Cat-Millard Co. Line; Beaver county. This project extends from the north end of the Wild Cat canyon, Federal Aid Project No. 26, to the Millard county line, connecting up with F. A. P. 68. It will be gravel surfaced and about 5 miles in length.

F. A. P. 70.

Nephi-Levan; Juab county; 9.5 miles. This is a proposed gravel surfaced project between Nephi and Levan connecting the concrete surfaced project No. 53, now under construction in Nephi City, with the gravel surfaced Project No. 17 between Levan and Scipio.

F. A. P. 71.

Uintah River Bridge; Uintah county; 100-foot steel truss. This project will cover a structure over the Uintah river east of Fort Duchesne in the Ouray Indian reservation and will be a 100% federal aid participation in costs. The project statement was recently submitted to the bureau of public roads, approval of which has not yet been received.

F. A. P. 72.

Devil's Gate-Weber; Davis county. This project extends from the Devil's Gate wagon bridge to the Weber county line. This includes a piece of road in Weber canyon which is badly in need of improvement. The location survey is now being made by Mr. Jos. M. Tracy and is about 50% complete.

Road Improvement in Iron County

(Continued from Page 8)

must be located permanently; all the structures must be built according to specifications, so that in the near future the gravel surface can be leveled down and concrete or other hard surface pavements built on the foundation we are now laying.

"The federal government has set aside money to be spent on the Zion Park scenic highway and two projects are now being lined up. The survey has just been completed from Cedar City to the Washington county line and a contract for construction of 11 miles of the project, Cedar-Kanarra, and surfacing with gravel will be let this year. Surveyors are now working on another project of ten miles in length, beginning in Parowan and extending beyond the Winn Hollow.

"For the purpose of cooperating with the National Forest service, the commissioners of Garfield and Iron counties have petitioned that the Little Creek-Orton road be surveyed south of the Little Creek peak and constructed under the supervision of the forest service. This route will shorten the distance between Paragoonah and Panguitch approximately 18 miles and give us an all-the-year route.

"There are numerous other roads which have been and are maintained by the county, among them being Kanarra and Cedar Mountains, Cedar-Parowan "Y" and Modena-Enterprise.

"We feel that, in proportion to the population, Iron county is doing as much, if not more, than any other county in the state in building and maintaining roads."

FUNDS AVAILABLE AND EXPENDITURES BY COUNTIES DURING AUGUST

	Available Maintenance	Expenditures Maintenance	Available Construction	Expenditures Construction
Beaver	$ 484.04	$ 237.74	$ 4,183.93	$ 4,183.93
Box Elder	8,047.71	.....	33,197.59	32,039.84
Cache	2,883.39	1,957.69	33,413.31	13,529.82
Carbon	1,239.32	.....	55,126.53	415.21
Davis	112.26	100.00	3,560.16	229.87
Daggett	14.98	.....	.....	.....
Duchesne	343.78	48.84	.....	.....
Emery	731.43	729.41	37,226.67	4,956.17
Garfield	1,014.48	111.25	.....	.....
Grand	1,646.13	548.85	27,390.69	7,877.70
Iron	3,456.60	2,001.05	19,552.55	8,165.05
Juab	2,475.58	384.18	99,160.55	6,007.25
Kane	10,705.62	3,152.00	.....	.....
Millard	2,759.46	213.74	84,237.92	32,605.16
Morgan	1,300.53	264.25	11,801.29	6,947.71
Piute	2,732.97	.....	14,434.11	1,951.38
Rich	1,419.19	43.50	10,535.49	6,036.95
San Juan	2,662.73	86.00	26,158.19	1,239.07
Salt Lake	4,425.86	4,514.76	22,702.68	7,652.42
Sanpete	1,997.87	862.22	50,390.11	5,951.93
Sevier	583.58	241.60	64,971.69	6,568.58
Summit	3,313.83	1,471.29	25,144.45	4,556.98
Tooele	2,060.18	349.65	20,095.71	1,179.53
Uintah	542.34	492.80	2,809.74	65.32
Utah	3,201.01	2,322.96	6,779.13	3,080.40
Wasatch	1,872.08	1,105.41	12,808.71	7,575.47
Washington	1,361.11	1,909.07	20,018.15	8,586.40
Wayne	1,070.17	125.00	.....	.....
Weber	3,452.22	3,026.80	6,426.46	245.15

Proposed Avintequin Route Into Uintah Basin

(Continued from Page 2)

route must be so located that it will not be abandoned when it is no longer required as a feeder to the railroad. In other words, the ideal route would have the low summit and minimum snow trouble of the Price-Myton; nearness to the railroad of the Castle Gate-Duchesne; and the directness to Salt Lake City of the Kamas-Stockmore route. Obviously no one fulfills all these requirements, however the route that must be chosen to serve best the needs of the Basin and interstate traffic is the one which combines its characteristics most nearly in accordance with the above requirements. This does not mean, of course, that the road on the federal highway system will be the only one improved. As intercounty interests demand, other routes will be maintained and improved. I shall now consider three routes, the Price-Myton, Castle Gate-Duchesne and Avintaquin according to the requirements just mentioned.

Routes Weighed as to Value as Railroad Connection to Basin

There enters into this requirement the question of directness or minimum distance, that of minimum snow fall over the high summits and that of grades. Each route will be weighed in this scale.

The Most Direct Route

The Castle Gate-Duchesne road seems to have the advantage on this point, it being 45 miles from Duchesne to Castle Gate, the nearest railroad point, however, as Price, the distributing point, is 11 miles south, this distance must be added, making a total of 56 miles. The Avintaquin road will certainly be a close second in point of distance. No survey has been made here and the exact distance cannot be now stated but it will be between 50 and 55 miles. The Price-Myton road is decidedly at a disadvantage in this comparison. It has the great disadvantage of reaching the Basin too far east, which makes necessary all travel from a territory west of Myton to back-track to Myton. The distance from Myton to Price over the Price-Myton road is 82 miles and the distance from Myton to Price by way of the Castle Gate-Duchesne road is 76 miles. The distance from Duchesne to Price by way of the Price-Myton road is 102 miles, or nearly twice the distance from Duchesne to the railroad by the western outlet.

Question of Winter Travel.

It might be well to state here that snow trouble, as an obstacle to traffic, depends not so much upon the depth of the snow covering as does the drifting of it upon the highway by the prevailing wind. In other words, two adjacent mountain summits might receive the same amount of snow fall but the direction of the wind may tend to sweep the snow from one highway location and drift it upon the other. The first instanced will cause scarcely any trouble and the second very serious trouble. It is admitted that the Price-Myton road has the advantage of other routes into the Basin when measured from the standpoint of winter travel; the summit of the Gate canyon is 7300 feet in elevation and the Nine-Mile canyon 7400 feet. Either of these summits is more than 1000 feet lower than either the Castle Gate-Duchesne or Avintaquin summits.

The Castle Gate-Duchesne summit presents a very serious problem as to snow conditions. It is so situated topographically that the prevailing west wind drifts snow out of the south fork of the Avintaquin on the road and it is quite certain that during severe winters it will take superhuman efforts to keep this road open. The elevation of this summit is 9100 feet above sea level. Another great disadvantage is the fact that this summit is 20 miles from the railroad which adds greatly to the inconvenience and danger resulting from snow blockades. On this route the section through Emma Park presents very serious difficulties also. It must be stated here that even though the postoffice department by very hard work kept the mail moving over this summit last winter the traveling public was compelled on many occasions to either pay expensive toll to be pulled through the snow or take the Price-Myton road.

A close study of snow conditions during the past winter, which study extended from Fruitland to the Bamberger monument revealed the fact that the amount of snow on the Avintaquin summit was minimum for this season. This summit is approximately 8800 feet above sea level and it would be absurd to claim that some snow trouble will not be encountered here. However, due to the fact that Trail creek, on the west side of the summit, and the west fork of the Avintaquin, on the east side of the summit, are so oriented with relation to the direction of the prevailing wind that with the exception of a short distance of one-half mile at the summit, the slopes of these two canyons where the road would be built are almost entirely wind swept, it is the writer's opinion that this road can be kept open with very little difficulty and another big advantage lies in the fact that the snow trouble which will be encountered will all be within 8½ miles of Soldier Summit, the railroad point.

Question of Grades

The Avintaquin road has a distinct advantage on this point, a maximum grade of 6% can be obtained on both sides of the summit. Another advantage is that there is but 1600 feet of adverse grade to the railroad on this route, that is only 1600 feet of the elevation surmounted is lost in descending to the level of the White river just east of Soldier Summit. Duchesne's elevation is 5500, the summit at the head of Avintaquin 8800 and the point on the White river just mentioned 7200. The grades of the Price-Myton route, it is thought, could be kept at 6%, however there is here 3700 feet of adverse grade; leaving Myton at an elevation of 5100 feet, one climbs to the Gate Canyon summit which has an elevation of 7300, then descends to the mouth of Gate Canyon to an elevation of 6100 feet and then climbs again to the summit of Nine Mile canyon, which has an elevation of 7400 feet, and finally drops down to Price at an elevation of 5550. The Castle Gate-Duchesne road is also at a great disadvantage compared with the Avintaquin; the grades on both sides of the summit are upwards of 10% and there is an adverse grade of 3300 feet. The summit elevation, 9100 feet, requires an ascent of 3600 feet from Duchesne.

Routes Weighed as to the Second Point, or Value as a Continental Link Leading to Salt Lake City

The Price-Myton road measured as to value as part of a transcontinental route leading to Salt Lake City must be left entirely out of consideration as Price is within 20 miles of being as far from Salt Lake as is Myton, measuring by roads west from both points. The Castle Gate-Duchesne road by way of Bamberger monument and Colton gives a distance of approximately 148 miles from Duchesne to Salt Lake City, while the Avintaquin route gives a distance of approximately 140 miles. A great disadvantage of the Castle Gate-Duchesne road, as a link in the route to Salt Lake, lies in the fact that from the Bamberger monument to Horse Creek Junction, the snow trouble will be nearly as serious as at the summit of Willow creek. This fact was revealed by the study of last winter.

Route Weighed as to Third Point, or Value of Road When Basin Railroad Is Built

The hopes for railroad transportation have been raised and blasted so often that many are pessimistic about its ultimate realization. However, it is hard to believe that it will be many years before this great country will be tapped by a railroad. Surely the state road commission must be permitted to include this contingency when considering the highway problem and the road which is to be placed on the seven per cent highway system must now be so located that when the railroad comes it will not be abandoned. To the writer it appears that the Price-Myton route as an outlet to the Uintah Basin would be absolutely worthless with the coming of a railroad, and the Castle Gate-Duchesne road would then be of no value except as an intercounty road. The Avintaquin road, on the other hand, being located as it is, would still be the main highway, based purely upon its value as an all year transcontinental link leading into Salt Lake City.

With the facts above outlined under the three cardinal points the state road commission felt justified in submitting to the secretary of agriculture the Avintaquin road for approval as part of the seven per sent system.

Criticisms of the Avintaquin Route

Upon the announcement by the state road commission of its selection of the Avintaquin road there was considerable agitation, especially in Carbon and Wasatch counties, and also quite determined opposition. The objections to date might be crystallized in the three following points: first, that there are enough highway routes opened into the Uintah Basin and there is no justification at present to expend large sums of money on another one; second, that the proposed route cannot be kept open due to snow trouble; third, that Price has been the distributing point for the Uintah Basin country since the beginning, and that the railroad company, commercial inter-

ests and the government have expended large sums in constructing facilities to handle the trade of the Basin and that it is presumptuous to think that the Basin distributing point can be moved.

In answer to the first contention it must be admitted that there have been mistakes made in the expenditure of money on roads leading into Uintah Basin. However, one can safely say that the sooner the proper route is chosen and constructed the better it will be for the state. It must also be admitted that at the present time the Uintah Basin is suffering severely due to the unsatisfactory highways. Something must be done at once to remedy the condition. It is true that with the expenditure of a large sum of money the Price-Myton road can be made a satisfactory outlet to the railroad, but is the state road commission justified in recommending a route as part of the highway system which has the objections enumerated in detail above, even assuming that the secretary of agriculture would approve their recommendations?

In answer to the second point as to whether the proposed Avintaquin route can be kept open, it is firmly believed that with reasonable effort this can be accomplished and it might be stated here that even if this route be approved by the secretary of agriculture there will be at least one more winter before any actual work takes place upon it, and there is yet opportunity for those who desire to make a careful study of the situation during the period of heavy snow.

We now come to the third contention, namely, that Price has been the distributing point and is the natural outlet to the Uintah Basin. One can not look upon the history of this matter but with a great deal of admiration for the Price business men who have so jealously guarded this claim of theirs—the Basin business. Anyone at all acquainted with the facts will readily see the serious consequences to Price of the proposed change. But, I believe the foresighted citizens of Price will concede that the fundamental problem before the commission is to furnish the best transportation possible to the struggling Basin country, and if they can be convinced that the proper route will not lead to Price, they will support the commission in the route chosen. I also believe that Price will concede that the state road commission with its entire organization is endeavoring by sincere, thorough investigation, to arrive at a solution for this very serious problem.

It would not be well, perhaps, to close this article without making brief mention of some of the engineering problems which will be encountered on the new route. The first thirty miles from Soldier Summit to the mouth of the Avintaquin presents about the same problems as to cost of construction that were met on the Castle Gate-Duchesne project. The topography of the country is quite regular. The natural material is in general good, being the typical broken down shale of this entire region. The remaining twenty miles, that is, the section from the mouth of the Avintaquin down the Strawberry river to Duchesne, presents some engineering problems. The course of the Strawberry river is very meandering. For perhaps one-half mile it will hug closely a solid rock cliff and then meander to the opposite side and follow a similar cliff. This condition will make necessary changing the channel of the river in places, and will also make necessary the building of several bridges across the river. However, a road can be built over this section within a reasonable cost. There is an abundance of surfacing material in the bed of the Strawberry river as well as at the mouth of several of the tributary streams so that on those sections where the natural material will not make good road bed, suitable material can be obtained at little expense.

In conclusion it can be stated that from an engineering standpoint, a feasible road can be built from Soldier Summit to Duchesne for a reasonable cost. The final decision rests with the bureau of public roads and the secretary of agriculture.

According to figures just issued by the U. S. geological survey the production of Portland cement in August broke all previous records, exceeding the entire production for any one of the years 1915, 1918 or 1919. The production during August was 12,967,000 barrels, an increase of 350,000 barrels over July and 1,300,000 greater than August of last year.

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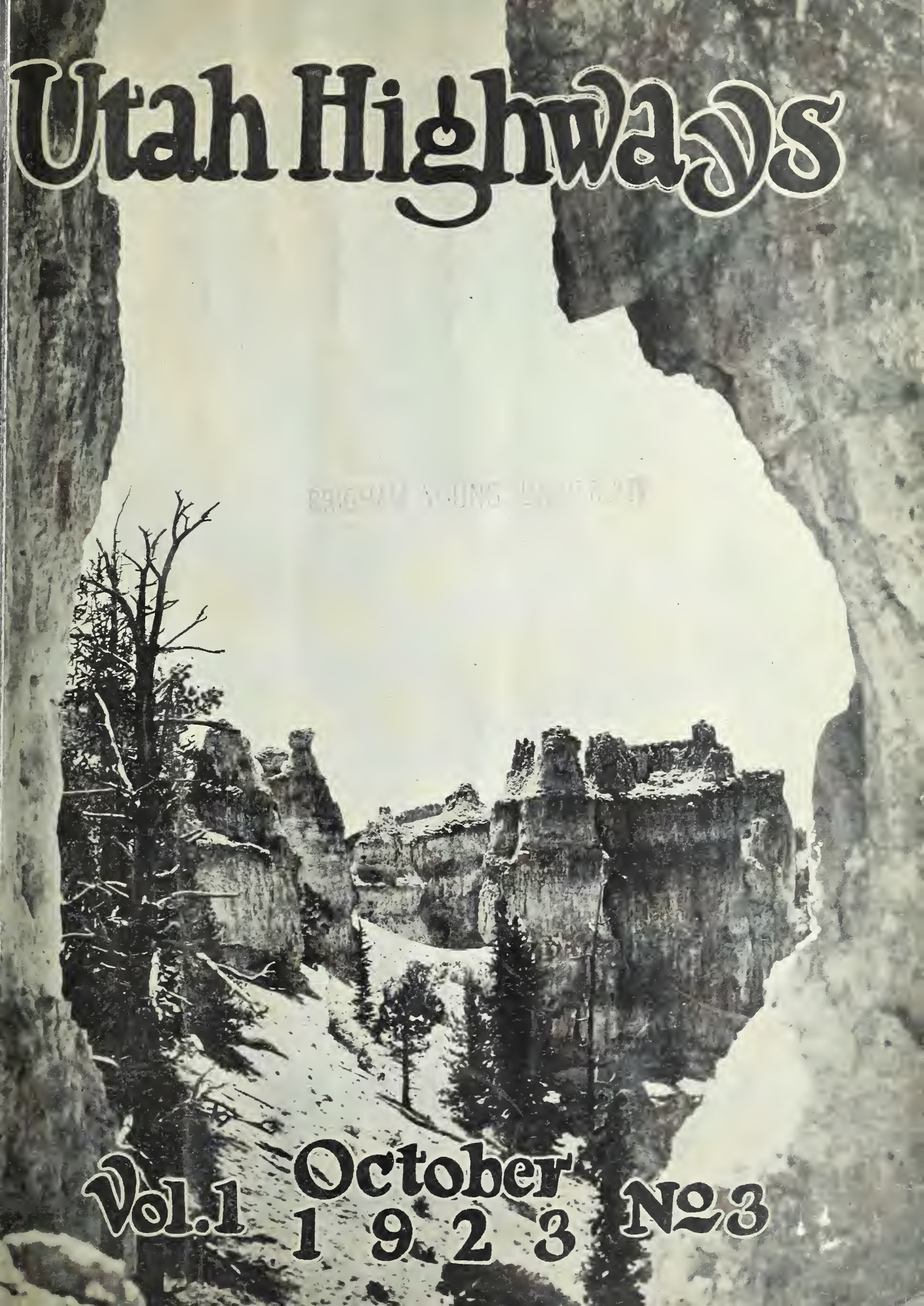


Vol. 1 October 1923 No. 3

ONE of the most colorful formations in southern Utah is that known as Bryce Canyon in the Sevier National Forest. The canyon walls are eroded so extensively and in forms so suggestive of vast temples with spires towering hundreds of feet into the sky that viewed from one of the interlacing canyons entering the formation, as shown in the scene on the cover of this issue, one seems to be gazing upon the prehistoric ruins of a mighty city. There are ribbed and fluted columns and spires, so symmetrical that they appear to be the handiwork of practiced artisans, sometimes standing alone and again grouped together into a great variety of forms. While the character of the erosion would be sufficiently spectatcular in itself, it is the vivid coloring that fixes the attention. These temple and cathedral forms are everywhere banded with a variety of hues of red, orange and yellow and often the topmost pinnacles are tipped with white, the predominant coloring in the canyon depending upon the conditions of sunlight and shadow.

From Panguitch, on the Grand Canyon road, it is about twenty-five miles to the head of Bryce Canyon.

Utah Highways

VOLUME 1. OCTOBER, 1923. NUMBER 3.

LINCOLN HIGHWAY IN ECHO CANYON TO BE FEDERAL AID PROJECT

The transcontinental highway entering Utah from Evanston, Wyoming, and reaching Ogden and Salt Lake by way of Echo canyon, is one of the most important roads in the state from the standpoint of interstate traffic. Both the Lincoln highway from the Wyoming line to Salt Lake by way of Echo and Coalville and the connection to Ogden from Echo are primary roads in the federal system of highways and it is recognized that it is of vital importance to the effective linking of this system that the road from the main forks in Echo canyon and eastward to the state line be improved to a much higher standard than it now is, and that it be adequately maintained.

A survey has been completed from the main forks eastward to Emory, eleven miles, and contemplates the improvement of the most unsatisfactory portion of the present highway. It provides for the line changes urgently required, due to the double tracking of the Union Pacific through the canyon this summer, and will eliminate six grade crossings on the main line and one on the Park City branch of the railroad. The road will be on the north side of the canyon, with the railroad between it and the creek channel for the entire distance, eliminating entirely expensive bank protection and will, in addition, afford a much better route for winter travel.

On September 22 the proposed location was inspected by officials of the railroad, the federal bureau and the state, and approved with the exception of some slight changes in alignment, which will be made at the request of the railroad in order to provide a minimum distance of 45 feet between center lines. This requirement will be maintained throughout except at one point where 40 feet will be permitted to avoid an excessive amount of rock excavation.

Financing the Project

Seventy-four per cent of the cost of construction on federal aid highways in Utah is paid by the government. Twenty-six per cent is paid out of the state treasury under the direction of the road commission but since the state has no general fund for road construction it is necessary that the funds for each project as it comes up for consideration be derived from some source—usually from the county in which the work is located—and placed at the disposal of the commission before construction can proceed. A detailed estimate has not been prepared of the cost of grading and gravel surfacing the eleven miles in Echo canyon, but preliminary estimates indicate a cost of from $140,000 to $150,000, there being three miles on this project where the grading costs will run exceptionally high. Summit county has already advanced $15,000 to initiate a federal aid project in Echo canyon, which, matched with federal funds on the basis described, would furnish about half the amount required to do the work. An underpass is to be constructed by the railroad as its share of the cost of construction to replace a temporary structure now in use, the estimated cost to be $32,000. Federal allowance on this structure, or about $24,000, will be requested to be used as an addition to the funds provided by Summit county to furnish the state proportion of 26% of the construction costs of the road.

Difficulties of Financing Improvements Where Not of Local Importance

In 1920 a state-aid project for a graded earth road beginning at the Wyoming line and extending west 13.8 miles was let and completed during 1921. The state and Summit and Rich counties have expended $75,000 for this construction, and $30,000 additional work has been done in further improvement and maintenance of the road in Echo canyon. It is acknowledged that this highway, one of the most important entrances to Utah, is, however, now in need of extensive improvements and more effective maintenance. It unfortunately happens that the Echo canyon road from the main forks eastward is of little value to the local interests of either Summit or Rich counties.

The difficulties of building and maintaining a correlated system of highways under conditions where the impetus for improvement must proceed from the local requirements of distinct communities has and continues to present some serious problems to the commission.

There are many miles of state roads of great importance to the state as a whole and essential to interstate traffic but which are a liability to the counties in which they are located. A passable road for the traffic needs of only a few years ago might with reason be expected to

(Continued on Page 9

Double track and siding in Echo Canyon showing one of the dangerous crossings to be eliminated by line change

Status of Federal Aid Projects

UNDER CONSTRUCTION SEPTEMBER 30, 1923

No.	County	Name	Type	Length	Per Cent Complete	Contractor
4-F	Emery	Castle Dale-Ferron	Gravel	11.5	15	J. T. Raleigh Co.
5-ABC	Grand	Thompson-Moab	Graded Earth	37.79	99	J. J. Coan-Clark & Bush
6-ABC	Grand-San Juan	Moab-LaSal Junction	Graded Earth	23.25	93	Hyde & Black
9A	Millard	Delta-Holden	Gravel Surface	10 61	94	Johnson, Gillespie & Adamson
9-G	Millard	Holden-Kanosh	Gravel Surface	5.14	90	Johnson & Badger
9-H	Millard	do	Gravel Surface	5.75	90	Mathews, Barrus & Wrathall
9-J	Millard	do	Gravel Surface	7.80	90	Meadow Const. Co.
9-K	Millard	do	Gravel Surface	4.98	90	George & Bird
10-B	Uintah	Ft. Duchesne-Vernal	Gravel	5.2	....	A. G. Young & Co.
10-B	Uintah	Ft. Duchesne-Vernal	Bridges—Wooden	.....	....	Caldwell, Batty & Eaton
12-A	Washington	Ash Creek-Andersons Ranch	Gravel Surface	7.30	59	McArthur, Winsor & Whitehead
12-B	Washington	Ash Creek-Andersons Ranch	Bridges—Concrete	.....	76	Snow, Cannon & Kemp
17-A	Millard	Scipio-Juab	Gravel	7.08	....	Hawley, Anderson & Hinckley
17-C	Juab	Levan-Chicken Creek Dam	Gravel Surface	9.04	82	Paxton, Dorrity & Black
33	Cache	Sardine Canyon	Gravel Surface	6.96	57	Olof Nelson
39	Salt Lake	Magna-Tooele Co. Line	Concrete	6.41	58	Moran Paving Co.
41	Morgan	Morgan-Peterson	Gravel Surface	7.8	83	Western Engr. & Const. Co.
42-A	Wasatch	Heber-Hailstone	Gravel Surface	7.46	50	Gilkerson Const. Co.
42-B	Wasatch	Heber-Hailstone Bridge	Steel Truss	.....	99	Christensen, Jacob & Gardner
43	Sevier	Richfield South	Concrete	1.5	....	Gray & Murdock
44	Sevier	Salina City	Concrete	1.5	12	Gray & Murdock
45	Emery	Woodside Bridge	Steel Truss	.....	87	Security Bridge Co.
46	Rich	Woodruff-Wyoming	Gravel Surface	7.4	70	Kroft & Bundy
47-A	Sanpete	Moroni City	Concrete	1.0	51	Reynolds-Ely Const. Co.
47-B	Sanpete	Moroni-Fountain Green	Gravel Surface	7.09	60	Reynolds-Ely Const. Co.
47-C	Sanpete	Fountain Green	Concrete	1.0	....	Reynolds-Ely Const. Co.
47-D	Sanpete	Fountain Green-Juab Co. Line	Gravel Surface	5.33	16	Reynolds-Ely Const. Co.
49	Summit	Gogorza-Salt Lake Co. Line	Gravel Surface	3.06	31	Moss, Snarr & Thayne
52	Sevier	Salina-Redmond	Concrete	1.5	40	Gray & Murdock
53	Juab	Nephi City	Concrete	1.77	24	Wasatch Grading Co.

Projects for which Plans have been Submitted:

F. A. P. 17-B.

Chicken Creek-Millard; Juab county; 15.0 miles gravel. Plans on this project were completed and sent to the bureau in July. Since then two major line changes have been decided upon involving a saving in distance of approximately one mile. A field party has completed the survey of these changes and the plans will be revised and resubmitted to the bureau.

F. A. P. 24-C.

Price-Underpass and Price City paving; 1.125 miles concrete. Bids on this project were received August 11. The Utah Concrete & Stucco company were the low bidders. The commission could not let the contract on this work, however, until the right of way railroad participation situations were cleared up. The county has signed an agreement for the necessary right of way with the Denver & Rio Grande railroad. The hearing before the public utilities commission to determine the amount of railroad participation the underpass structure was held September 26. Until a decision is reached on this matter and approval is given on the right of way agreement by the federal bureau, no construction work can be done on this project.

F. A. P. 31.

Riverdale Overhead crossing; Weber county; 0.5 mile. Plans for the railroad's portion of this project have been approved by the district office of the bureau of public roads with minor corrections. Plans for the highway portion have been submitted to the bureau and approved. As soon as the agreement for construction is executed by the railroad and the county has secured the necessary right of way the state will advertise for bids.

F. A. P. 50.

Payson-Juab Co. Line 8.56 miles hard surface. Plans for this project were submitted to the bureau of public roads in July and approval will very likely be of way through Payson and near Spring given within a short time. If the right Lake is obtained by Utah county, this project will be ready for advertising for bids and some of the grading completed this fall.

F. A. P. 51.

Timpie-Wendover, Tooele county; 74.2 miles gravel. See discussion under "Wendover Road" this issue.

F. A. P. 56.

Redmond-Sanpete, Sevier county: 2.13 miles gravel surface. Plans on this project were submitted to the bureau of public roads last month. It is planned to advertise it, together with Project No. 57, so the date of opening of bids will be controlled by the latter project.

F. A. P. 57.

Gunnison-Sevier; Sanpete county; 10.37 miles gravel and hard surface. Plans for this project have been submitted for review.

Plans in Course of Preparation

F. A. P. 54.

Cedar-Kanarra, Iron county; 11.0 miles gravel. The location of this project was recently completed by G. A. Gregory, locating engineer. The plans are about ready for submission to the bureau and every effort will be made to rush this project so that construction can be started this winter.

F. A. P. 55.

"Black Ridge," 4.3 miles gravel surface in Washington county. This project will consist of the grading of what is now known as the "Black Dugway," which is a very steep and dangerous section. It is planned to widen this to standard width and reduce the grade to a 5% maximum and surface with gravel. Every effort will be made to rush this project so that some construction may be started this winter.

F. A. P. 55.

Layton-Clearfield; Davis county; 4.11 miles of resurfacing and widening of present 16-foot concrete road. Plans of this project are 80% complete and call for the resurfacing with concrete or bituminous concrete and the widening to 20 feet of this road. It is not planned to do any construction this year.

Projects for Which Surveys have been Completed

F. A. P. 58.

Cache-Mantua; 4.14 miles gravel; Box Elder county. The survey for this project was recently completed by K. C. Wright. The project as surveyed extends from the Cache county line into Mantua. A project statement has been submitted to the federal government covering this location. The plans will be completed this winter so that construction can start early in the spring.

F. A. P. 60.

Echo-Emery; 11.0 miles gravel; Summit county. The survey for this project

(Continued on page 9)

Construction of Hanksville Bridge

BY JEAN R. DRIGGS, Resident Engineer

The Hanksville bridge, spanning the Fremont river, at the eastern extremity of the state road in Wayne county, is at such a distance from the usual routes of through travel that there are probably very few people in the state acquainted with the country this structure serves and with the significance of this portal of the desert.

The splendid scenic attractions of this region have remained a sealed book to the hardy tourist and the improvement of its roads will never be a factor in serving the needs of transcontinental traffic, but is nevertheless of importance in developing the resources of the state.

The transportation problems of Wayne county are both difficult and unique. As an example, the purpose of the bridge is not, primarily to serve the needs of vehicular traffic, but to facilitate the movement of sheep and cattle to ranges and markets.

Some description of the country around Hankville, its resources and market connections, will be desirable, both as showing the need of a crossing at this point and as elements affecting the details of construction.

Wayne county is divided, topographically, into east and west portions, the preponderance of the population being west of Torrey, at which point the mail leaves its motor transport and is carried by buckboard or pack saddle to the more remote settlements of Fruita, Notom, Cainsville and Hanksville.

A vast cattle and sheep range is the principal source of revenue for the people of this section of the state. The winter ranges are in the Henry mountains, to the south, in Garfield county, and extending to the Colorado river; the summer ranges lie north of the Fremont river and cover a large part of Emery county.

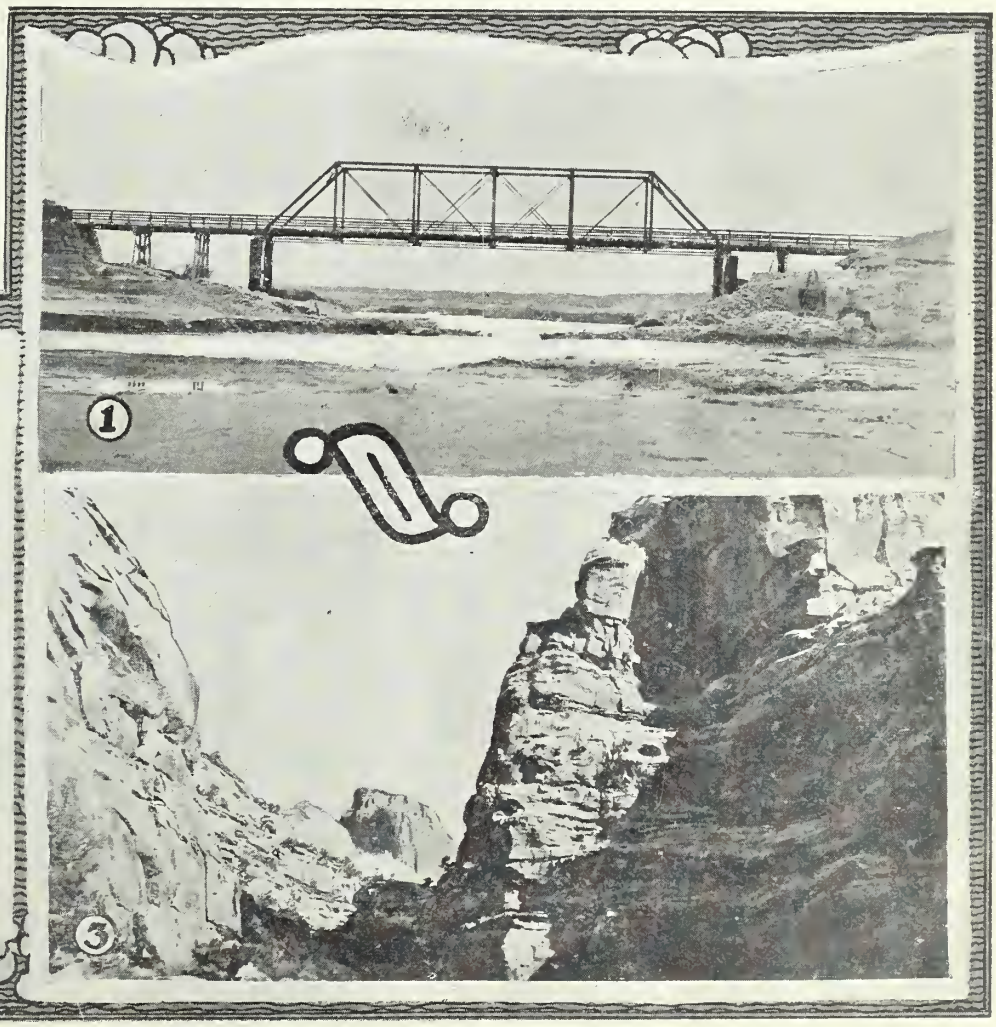
Considerable difficulty, and not infrequently great loss, has been experienced in driving the herds back and forth across the river, and the bridge has been erected at Hanksville to afford a safe crossing for this purpose and to provide a route eastward to the railroad for the settlements in the eastern section of the county. It is of further advantage in increasing the amount of live stock moved north and south across Wayne county, as the county places a tax upon this traffic and it provides a valuable source of revenue.

There is considerable competition, locally, for the marketing of live stock. Sigurd, on the west, has railroad and through highway transportation, east of Hanksville and across a 70-mile stretch of desert is Green River, offering the same facilities. Sigurd serves best the region west of Torrey, and this situation has had considerable effect on the road program, and, as indicated on the state map in this issue, the road improvements lead from Hanksville to Sigurd rather than to Green River, although Sigurd is 125 miles from Hanksville.

Obstacles to Road Construction

There are two natural barriers that confront the road builders in providing a route to serve the eastern portion of the county. To the east the road to Green River lies across a desert of shifting sand and is almost impassable for motor traffic during the summer months. In addition there is a treacherous quicksand stream, the Little Muddy, some five miles out from Hanksville that has baffled many experienced drivers. However, this stream is not a serious obstacle to crossing with cattle and sheep. During the winter months when the sand is wet or frozen and the Little Muddy is hardly more than a foot deep, the Green River route is the better for automobile traffic.

West of Hanksville the road barrier is a great reef which rises in the vicinity of San Rafael and, crossing Wayne county, circles to the south and west to contribute to the impressive scenery in Bryce's canyon, Cedar Breaks and Zion's canyon. There is one opening in this reef in Wayne county, Capitol Wash or Capitol Gorge, about six miles in length.



(1) Hanksville Bridge. (2) The road through Capitol Wash. (3) Opening in the canyon wall, Capitol Wash

It carries no water except occasional floods during July and August when the narrow roadway in the floor of the wash may be covered to a depth of 25 feet.

A trip through this gorge is one never to be forgotten and at some future day it will be widely advertised as one of Utah's scenic wonders. The side walls are vertical faces of sandstone with all varying shades of reds and browns, ranging to buff, yellow, cream and white. The ravines that open into the gorge give one a glimpse of a mysterious wonderland, extremely difficult of access, of variegated color and fantastic formation.

Since the improvement of the road through Capitol Wash and the construction of the Hanksville bridge there is a safe and convenient route for automobile traffic during the summer months into the town of Hanksville and to the Henry mountains. Mount Ellen, which can be reached by the road leading into the Saw Mill basin affords new thrills for the adventurer. The Henry mountains have abundant herds of wild burros and deer. There is a splendid stand of timber in the Saw Mill basin but due to its isolation it is only drawn on for local use.

Getting Materials to the Bridge Site

The Hanksville bridge is a through riveted truss, with a span of 120 feet and a roadway 12 feet wide, designed for a ten-ton truck. The abutments are of the tubular steel type 45 inches in diameter, extending 26 feet into the shale foundations. The bridge has a clearance of 23 feet above normal water level. There are timber trestle approaches approximately fifty feet long on each end of the steel span, thus affording a waterway more than 200 feet wide to take care of the flow during the later summer floods.

Due to the remoteness of the site it was planned to use local material so far as possible and authority was given me to select and purchase this at the most convenient points, the state to deliver all materials f. o. b. the bridge site.

As a result all the sawmill operators of the Thousand Lake and Boulder mountain districts were given an opportunity to supply timbers according to specifications. The timber furnished by these operators was a good quality of red pine, better than the commercial grades of common dimension timber and at a cost, laid down at Torrey, of $24 per thousand. Torrey is approximately the same distance from the bridge site as Green River, so the purchase of local timber was a distinct saving to the county.

The local saw mills did not furnish sufficient first-class timber for framing so it was necessary to go into the Henry mountains and select round timbers for the trestle bents and floor stringers. This timber was obtained during December with the snow several feet deep in the Saw Mill basin and it was with considerable luck and concerted action that this timber was brought down before the mountains became completely blocked with snow. The timbermen worked from daybreak until after dark working to get this material out ahead of the impending snowstorm.

Telegrams and Construction Crew Arrive Together

On one of the trips down from the mountains word was received—a telegram four days enroute—that the contractor was due that day with his entire crew and sure enough in they came as per schedule. Barely sufficient time was allowed to get them started on the foundations and falsework when another telegram arrived, also four days old, stating that the steel was in Green River awaiting inspection and unloading. Telegrams could be relayed by telephone to Torrey, but three days were required, with the winter mail schedule, to get it over the road from there to Hanksville, with the most favorable connections. A letter from Salt Lake was usually about eight days enroute.

Upon receipt of this telegram I started at once for Green River, making the trip in a day and a half on horseback and the steel was checked and unloaded.

The county commissioners had arranged to start teams to haul the steel from Green River, but after a delay of several days an exchange of telegrams disclosed the fact that the freighters had not yet started. The same day, December 23, another telegram reached me at Green River, an urgent personal message for one of the steel men at Hanksville. There was no way of its reaching him in less than four days except by messenger directly across the desert. At nine o'clock at night I found a driver and auto and started for Hanksville on what proved to be a remarkably wild ride across the desert. Midnight found us on the river opposite Hanksville where we left the car and crossed on the foot bridge which had been erected at the bridge site and the message was delivered.

The non-arrival of steel had considerably dampened the spirits of the bridge crew, they were expressive in their impatience at the delay and were anxious to get through and go home. The people of Hanksville also found dissatisfaction in their allotment of freight.

Hanksville Invades Green River

It is the custom of the county commissioners to divide the road work among the various settlements along the route and Hanksville had just been advised of its quota of haul on the steel. It appeared, however, that the commissioners had not been advised the full tonnage to be hauled, and not only that but had planned to make several trips, so to expedite matters I gave permission to the people of Hanksville to haul all the steel they could and haul it at once. The teams were on the road without delay and Green River must have been surprised to see fifteen freight outfits come driving in from Hanksville, a village of twenty families; a go-after-it and get-it spirit that might be emulated by larger towns. They loaded up and were ready to start back two days after Christmas. As it happened there was just enough freight left to load up the outfits from the upper end of the county and all the steel went across in one trip instead of three.

As we were then able to complete the falsework and put the trusses in place before zero weather and the resulting ice jams in the river, the bridge was completed approximately 30 days earlier than would have been the case if the original plans of freighting the steel had been executed. The men who were cut short in the freight were given additional work at the bridge, hauling sand and gravel, to give them compensation for loss on the extra trips for steel.

Method of Construction

Extreme precautions had to be resorted to in the construction of the false work for this bridge. The river bottom consisted of quicksand so treacherous at this point that neither horse nor man was able to ford the stream. Three piers, the center one being 20 feet square, were constructed of logs from the drift wood washed down during the floods. A solid floor of these logs was first laid for a base but the sand was so yielding that as the cribbing was added they settled into the river bottom to a depth of seven feet. The piers were connected with log stringers, the whole affording a substantial base for the usual falsework.

Almost as soon as the cribbing was above the water level the weather turned cold and continued until the temperature was 22 degrees below zero. During this time the river would freeze over at night and in the day time the water would flow over the top of the ice to freeze at night again. The water was so laden with quicksand that a layer of sand would form between each layer of ice until the level of the river had risen about eight to ten feet and all our bottom falsework and stringers were buried.

A sudden break in the weather caused the ice to melt so suddenly that a part of the falsework was carried out in the night. However, the danger had been anticipated and the steel crew had the truss held in place with erection bolts.

Through the spirit of cooperation shown by the people throughout the county in getting out timber and hauling supplies the bridge was completed within the contract time and under the estimated cost. The obtaining and hauling of timber from the mountains during the winter months, the hauling of steel and other material across the 70 mile desert and the erection of the structure were all accomplished without a single accident.

Gasoline Tax Brings Considerable Revenue

The gasoline tax of 2½ cents per gallon authorized at the last session of the legislature and in effect March 8, shows the following returns to August 31:

March	$13,177.23
April	26,093.90
May	45,788.80
June	66,728.03
July	66,821.05
August	59,785.80
	$278,394.81

It is estimated that in addition to the automobile license fees about $300,000 of the funds obtained from the gasoline tax will have to be applied to cover interest charges and sinking fund on state road bonds before any revenue from this source will be available for road maintenance.

Wendover Construction Proceeding

Work is proceeding on the construction of the subgrade and structures over the eight miles known as the "Salt Section" on this road. It is necessary to cut through three or four feet of solid salt on this section in order to obtain the underlying clay to be used in constructing the embankment. Wooden structures will be used throughout, the deterioration of metal being so rapid that its use will be avoided in the construction of the wood box culverts, hardwood pins being used in its stead.

Bids were opened on October 2 for the construction of the remainder of the subgrade and the gravel surfacing of the entire 40 miles of the project but were found to be considerably in excess of the engineer's estimate and all bids were rejected.

The project is being readvertised and bids will be opened November 1. Some revision is made in the specifications in order to more clearly define the requirements and the amount of work necessary to satisfactorily complete the various items in the bidding schedule, particularly with reference to placing the gravel surfacing.

Most of the grading to be done will be across mud flats where the use of drag lines will probably serve as the most economical method, construction of the embankment with a trencher being permitted provided a brim of fifteen feet is left between the toe of the slope of the completed fill and the borrow trench.

From Wendover, on the Nevada line, to a point about two and one-half miles east the gravel will be obtained from a pit at Wendover and will be hauled over the Western Pacific which parallels the remainder of the project and unloaded in windrows along the track bed for the balance of the distance. It will be furnished the contractor in this position on one schedule and an alternate bid will permit him, if he so elects, to furnish and ship the gravel himself. The surfacing will be laid in two courses, pit-run (from Dyke pit) with sizes in excess of three inches removed for the base course, which will be six inches in depth, and pit-run with sizes in excess of one inch screened out for the top course which will be three and one-half inches in depth, both measured uncompacted in the roadway. The basis of payment provides a separate unit price for each course, and rolling will constitute a separate item.

The work to be done on this project covers the most necessary improvement on the main east and west highway in western Utah.

An Official Milestone for Every City or Town

An official milestone for every city and town in the United States from which local distances can be measured is the suggestion made by the American Automobile association. The designation of an official central point in each city and town by the proper municipal or town authorities will be of value commercially as well as a convenience to local and visiting motorists, points out the A. A. A.

"Every motorist will recall similar experiences in reading sign posts along almost any road in the United States," said an official of the A. A. A. "One sign may read '8 miles to Jonesville.' A mile further on another sign may also read '8 miles to Jonesville.' Both signs may be correct, depending on the point in Jonesville from which the mileage was taken. With an official milestone and the mileage accurately measured, the motorist would know definitely the actual mileage to the center of the town to or from which he is traveling.

"From a commercial standpoint an official milestone would be of service in giving readers of advertisements of real estate, for example, definite information. A farm may be advertised as being six miles distant from Jonesville. With the adoption of an official milestone by Jonesville the reader would know that the distance is six miles from a fixed point in Jonesville, which would be in the heart of the city.

"With the adoption of the Zero Milestone in Washington all distances on all A. A. A. maps out of Washington are measured from this point. Since the dedication of the Washington Milestone a similar milestone has been placed in Los Angeles. The plan of these two cities should be followed by every city and town in the country.

The cost of putting up the official milestone can be negligible. A simple marker could serve the purpose. Automobile clubs in many instances will be willing to erect the marker or milestone for the city or town. If it is so desired, the milestone can also serve as a memorial to some citizen who has served his community well in the early days of the development of highways.

Commission Empowered to Provide Road Markers

The commission is empowered to prescribe standard guide boards and road signs or other devices for the guidance of traffic and to regulate their use on all state roads in the state.

Although the commission has jurisdiction, under the statutes, in matters relative to signs on state highways, it is not required to put up signs and markers and has exercised the authority vested in removing advertising signs where such were considered detrimental to the use of the highway, leaving to the automobile and highway associations the erecting of signs and markers for the guidance of traffic.

It is now considered that a uniform system of standard road signs should be adopted and all through routes on the state road system properly marked in view of the fact that many of the signs erected by the agencies mentioned are considered inadequate for the proper guidance of traffic and many of the signs that have been erected are disappearing.

For this purpose a route map is being prepared in the office of the commission which will soon be available for publication and in accordance with which it will proceed at once to mark all the trunk lines in the state. Individual activities of would-be trail blazers will be discouraged and the highways kept free from unimportant or confusing signs. A case of this kind came to the attention of the commission recently when a resident of Idaho fared forth to Salt Lake City, and, possibly, being of a sanguine temperament, he marked posts and poles along the way with bright orange bands, even going so far as to bring his trail with him into the city and marking the lighting standards in the business district.

Vialog Used to Test New York Highways

The New York highway department uses a device attached to the dash of an automobile for recording the irregularities in the pavement. Not only can a graphical representation, on a reduced scale, be made of the depressions and lumps in the road, but the instrument has an integrating device by means of which it does its own adding and sums up the total irregularities encountered. When it is desired to use the chart a strip of paper 6 inches wide is unwound through the instrument at a rate proportional to the speed of the vehicle by means of a flexible shaft geared to one of the front wheels, and two pencils mark on the chart the smoothness or lack of it in the pavement encountered. Each pencil is connected with the front axle in a simple but effective manner so that when either front wheel strikes a surface variation the pencils are actuated accordingly. The scale of the chart is 1 inch=50 feet of road and ⅛ inch=1 inch of vertical variation.

A car can make charts at a speed of 20-25 miles per hour and sum up irregularities on the integrating device without charting at a speed of 30-35 miles per hour.

The pavements inspected are rated in inches of vertical irregularities per mile, the scale ranging from below 35 inches for smooth to 500 inches for rough riding road. Pavements registering over 300 inches should be extensively repaired and pavements registering 500 inches or over are ready for a reconstruction contract.

All of the principal routes on the New York state roads have been inspected by this method and show some interesting comparisons particularly with reference to lack of uniformity in construction.

The New York highway specifications require that when the Vialog record shows surface regulations in excess of 50 inches per mile the contractor shall reduce such irregularities by bush hammering or other methods until the Vialog chart shows that the pavement does not exceed 50 inches of variation in any one mile.

Utah Highways

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H. V. RICHARDS, Editor

PROJECT STATEMENTS TO CONFORM TO FEDERAL ROAD PROGRAM

The United States bureau of public roads has described in "General Memorandum No. 14" the procedure to be followed by state highway departments in making application for federal aid in the improvement of any portion of the roads that have been designated as a part of the federal highway system.

Beginning with December 1st, it will not be sufficient to submit a project statement setting forth the need for the improvement of a few miles of a primary or secondary route and detailing the conditions with respect to local or inter-state traffic, or both, which render the early improvement of such mileage desirable. A more extensive application of the relation of the improvement with respect to the through route of which the project will eventually form a part is stressed in the bulletin.

Two "control points" are to be selected and the project statement must cover the entire distance between these designations. These control points will be at such locations that they will constitute,—either from the nature of the topography through which the route passes, or their commercial importance, or their position with respect to interstate connections,—permanent objectives for that section of the federal highway.

Preliminary to the request for federal funds to aid in construction, engineers from both the federal and state highway organizations will make a reconnaissance survey for the purpose of determining the location of the connecting route, estimate its cost and weigh the respective advantages of alternate lines with reference to directness of route, serviceability to local interests, the comparative costs of structures for waterway and railroad crossings, and so on. A map will accompany the statement submitted showing the control points and the proposed location. It is not essential that the lines be accurately run and platted or that elaborate estimates be prepared, but enough information is to be gathered to give assurance that any improvements will lie on the proposed route.

Upon approval of the project for participation in federal aid the highway department will not be required to proceed with the construction of the entire included mileage, but may, from time to time make surveys and prepare detailed estimates for construction agreements over such portions as are most in need of improvement.

The original federal highway Act of 1916 provided that the United States should aid the states "in the construction of rural post roads and for other purposes." It was not a fixed requirement that federal funds appropriated under the Act be expended entirely upon the rural post roads but it was a condition precedent. The improvement of all the post roads in Utah would not have provided a connected system and the form of project statement then adopted permitted the improvement of isolated sections of highway.

The amendment to the federal Act has lead to the establishment of a connected system of 230,000 miles of national highways, and the revised procedure for initiating a project for improvement is for the purpose of assuring the expenditure of federal funds in the upbuilding of this system and providing that where the limitations of a state's program may require the construction of a few miles of road that begin and end nowhere in particular such improvement will eventually form a part of the entire system.

THREE CONTRACTS TAKEN OVER BY BONDING COMPANIES

On three gravel surface projects the contractors have made such slow progress that the state has found it necessary to require the bonding companies to take charge of the work and proceed with the completion of the contracts.

A variety of reasons appear to have operated to cause these failures: labor shortage, due to unusual local conditions; unit prices too low to pay construction costs with the methods used; lack of proper management resulting in lost motion and delays; equipment inadequate to operate effectively. Summed up, all of these causes indicate insufficient financial resources, lack of knowledge of the nature of the work and failure to properly analyze the costs.

It is the general policy of the commission to let a contract to the lowest responsible bidder, "responsible" meaning one who can obtain from an approved bonding company security equal to the amount of the contract award. The amount of the contract is based upon the unit bid prices for labor only, the state tests and selects the gravel to be used and furnishes all materials entering into the construction, other than those of local occurrence.

In these and in all other road contracts the state is fully protected and holds the bonding company responsible for the completion of the work to specification requirements when the contractor is unable to make satisfactory progress.

Such occurrences as these under consideration indicate that it may prove advisable to adopt a policy in force in a number of states of requiring each bidder to furnish a statement setting forth his experience in the work to be undertaken, his financial resources and equipment available, this information to be taken into consideration in awarding the contract.

The purpose of this procedure, if adopted, will be to protect the citizens of the state from loss in attempting a contract where it is not reasonably clear that they can conduct it with satisfaction to themselves and the state, and with a minimum of inconvenience to the traveling public.

RECONSTRUCTION OF DRAINAGE CHANNELS IN FLOOD DISTRICTS

Rapid progress is being made by the state and counties in clearing the highways blocked by the Willard-Farmington flood described in our last issue.

The treasurer of the flood relief committee reports that nearly $90,000 has been subscribed toward the fund for the relief of the stricken inhabitants at Willard and Farmington.

The stream channels, irrigation ditches and flumes have been completely filled in these districts and the state engineer's estimate shows that not less than $30,000 will be required to restore these waterways. Rains the last week in September have caused additional damage, due to the blockade of the usual water channels, and at a meeting of the state flood relief committee with Governor Mabey authority was given to expend $9,000 at once in clearing stream channels leading from the canyons where the floods of last August originated.

Two Federal Aid Projects Completed

Federal Aid Project 38-A

Brigham-Corinne, 4 Miles Hard Surface

This road is an extension of the main north and south paved highway which will soon have a continuous paved strip for a distance of 150 miles.

The new road bears a heavy traffic, is located on low ground and for much of the distance the paving slab is placed on gravel fill. A break in the paving occurs immediately west of Brigham at the railroad crossing, where a grade separation crossing is to be constructed as Federal Aid Project 38-B. The paving is the heaviest laid by the state to date and is 7½ inches thick throughout.

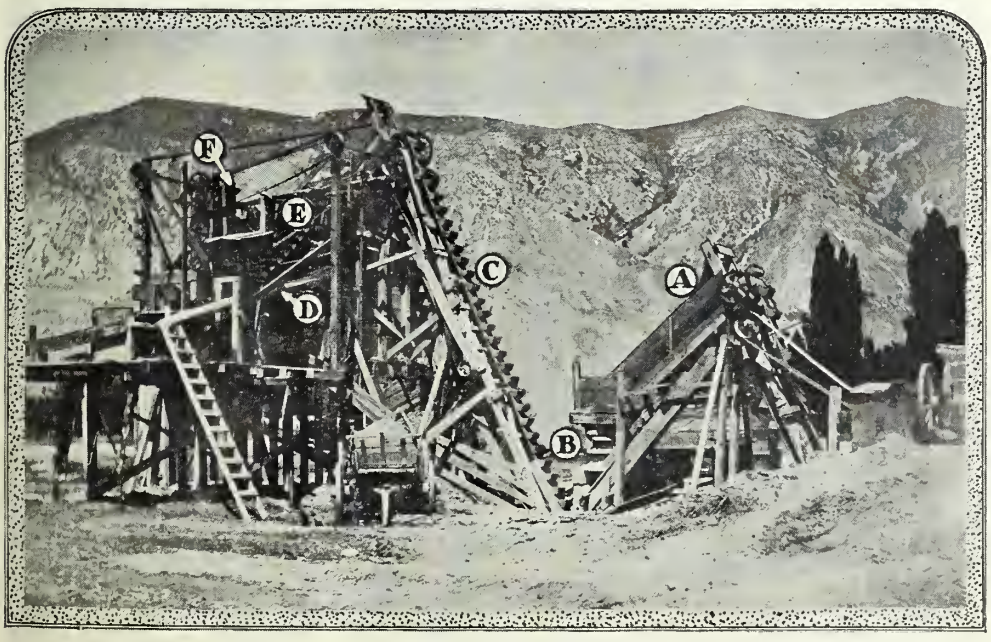
Due to restrictions of the federal law which limit federal aid to not more than one mile within the corporate limits of a city, about half a mile of the project was paid for by the county without federal aid, the connection to the present pavement in Brigham was paid for by the city. The construction costs on this project, given in considerable detail, are printed in this issue.

The photograph shows a washing plant, designed and built by the contractor, Gibbons & Read, for use on this project. It was remarkably efficient in operation, and the handling of the aggregates in this machine are described by K. C. Wright, state's engineer on this construction:

"An elevating loader was constructed in the bed of Box Elder creek, the materials elevated into dump wagons and hauled to the washing plant and dumped into a hopper shown on the extreme right in the picture. Material was taken from this hopper by the elevator and elevated to the grizzly screen at "A" where material under one and one-half inches was separated and by-passed around the crusher. Over sized material passed into a Telsmith No. 3 crusher shown at "B". The total product was then elevated, the elevator shown at "C", to a revolving screen on top of the plant. Water first struck the aggregates on this revolving screen. The sand was washed through and came down the spout, shown at "D" into laundry where it was washed and then dragged up the incline dehydrator by the angle irons, shown on the wide belt at "E" and discharged into the sand bin. The coarse aggregates, after being partially washed on the revolving screen, passed down an inclined trough into a Gilbert washer, washed and passed over a ⅜ inch screen, and then elevated by means of a vertical elevator, shown at "F" where it was discharged onto a ¼-inch screen. A stream of water under pressure struck the gravel on this screen and washed through the screen the film of dirty water which we found clinging to the particles of rock after they had passed through the Gilbert washer.

"After leaving the Gilbert washer the coarse aggregates were passed on to a ⅜-inch screen, where the pea gravel was separated, to reduce percentage of fines, and directed into the wagon shown about the center of the photo.

"Material taken from the creek averaged about 5% silt before washing; this plant turned out a product which varied from 0.6 to 1.5% silt. The capacity of the plant was limited only by the capacity of the elevator, and turned out an average of approximately 250 cubic yards per day. The entire washing process consumed approximately 250 gallons of water per minute."



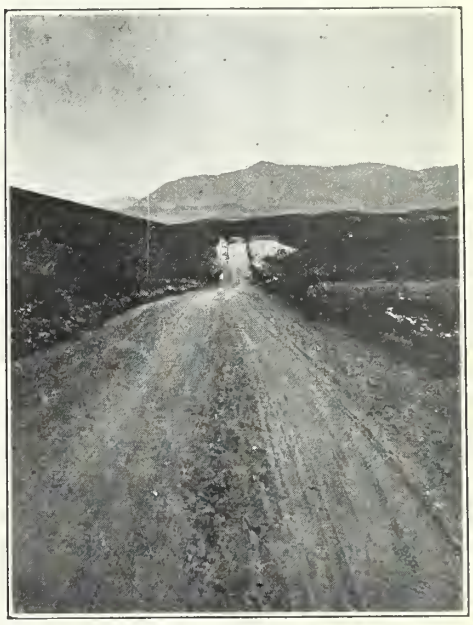
Washing plant used in the construction of the Brigham-Corinne road

Federal Aid Project 19-A

Marysvale-Junction, 12.5 Miles Gravel

BY H. S. KERR, Asst. Chief Engineer

Two sections of the highway between Marysvale and Panguitch have recently been completed, one, F. A. P. 19-A, A. G. Young & Co., contractor, extends



Graded earth portion Marysvale-Junction road

southerly from Marysvale a distance of 12.5 miles, the other is a federal forest project in Circleville canyon southerly from the Piute-Garfield line, 4.3 miles.

It was first contemplated to hard surface 4.5 miles of 19-A from Marysvale south, where the traffic was the heaviest, but gravel surface finally decided upon and has proved very satisfactory. The remaining mileage of the project, as also the Circleville canyon project, was not surfaced, the adjacent natural material averaging better for road purposes than perhaps anywhere else in the state for a like mileage. The completed highway is is 24 feet wide, a decided contrast to the connecting narrow highways, and the material used and structures supplied have resulted in a dependable all-season road.

It is anticipated that the remaining sections in Piute county will be reconstructed in the near future, to the same standards, and, later on, through Garfield county, southerly, also.

For the surfacing south of Marysvale metamorphosed broken down porphyry was used, the pit being three miles north of Marysvale, and adjacent to the Marysvale-Richfield highway. This material is exceptionally good for surfacing, as was determined by laboratory tests, and the completed highway has proved very satisfactory, as also have the unsurfaced sections above mentioned.

Radical changes were made in the loca-

Circleville Canyon Road

tion, to reduce gradients and eliminate curves, and the completed projects can consistently now be referred to as "Exhibit A" to many citizens of the state who are imbued with egregiously mistaken idea that engineering costs are a needless expense when road construction is being undertaken.

Marysvale being a railway terminal and the shipping point for Piute, Garfield and Kane counties, results in quite heavy traffic over the highway referred to, which traffic is now supplemented in increased ratio each year by visitors to southern Utah points of interest. To all making use of the recently completed sections the fact has been apparent that present standards and engineering result in very satisfactory highways, fully as satisfactory for Utah roads having about the same traffic, as would be more expensive types of surfacing.

Expenditure Itemized on Brigham-Corinne Road

Costs of F. A. P. 38-A, Oct. 1, 1923

Subgrade

Labor

Common excavation	$ 1,565.76
Exc. for open drains	366.09
Borrow	5,876.51
Overhaul	2,811.62
Structural excavation	89.60
Class "A" concrete	1,030.20
Class "B" concrete	614.60
Class "C" concrete	1,602.00
Pipe culverts	986.65
Placing reinforcement	127.41
Miscellaneous Labor Items	141.49
Total	$15,211.93

Materials furnished by the state:

Cement	$ 826.84
Pipe culverts	2,024.60
Other materials	583.75
Total	$ 3,435.19

18-Foot Concrete Pavement

Labor

Cement concrete, 7½ inch	$48,868.60
Reinforcing mesh	233.44
Miscellaneous items	230.32
Total	$49,332.36

Materials furnished by the state

Cement	$34,997.87
Reinforcement	4,168.08
Total	$39,165.95
Labor, materials, subgrade	$ 18,647.12
Labor, materials, pavement	88,498.31
Preliminary engineering	1,420.41
Const. Eng. and inspection	5,116.00
Total cost project	$113,681.84
Cost per mile	$ 28,420.46

Urge Uniform Traffic Laws for Every State

In these days when every local governmental body is frankly experimenting with the control of motor traffic it is a pleasure to call attention to one rule that has been successful wherever applied, namely, the rule requiring traffic to stop at what are commonly called boulevards, or through traffic streets, or arterial highways. Whenever this rule is promulgated and enforced a sharp decrease in traffic accidents is immediately noticed.

Such a rule has now been in force for some months in the city of Indianapolis and it has added greatly to the pleasure as well as the safety of driving a motor car in this city. Before the rule went into effect, cars darted across boulevards from minor streets and alleys with hardly a look at the boulevard traffic. This resulted in many collisions and it was necessary for the boulevard traffic to be constantly and keenly alert to avoid them. City trained drivers from other places complained of this condition, saying that in their home cities boulevard traffic had the right of way and this led them to expect similar conditions here and threw them off guard against traffic from minor cross streets.

This phase of the matter deserves emphasis. So many cities are now protecting boulevard traffic that all should do it, as an ever increasing number of motorists expect and depend on it. There is probably hardly a city in Indiana which does not have at least one through traffic street on which the traffic should be protected from that on the intersecting streets. The rule is popular as people quickly appreciate the protection it affords.—Indiana Highways and Motors.

Billion Spent Annually to Build New Highways

Construction is this country's greatest business, except agriculture. And road building is the most important part of construction. This, according to government statistics.

One half of a billion dollars represents the total of federal and state appropriations for highway construction during 1923.

The time is not far distant when one year's road expenditures in this country will reach one billion dollars.

Compared with this year's road building, the great Roman highways in Great Britain, the great Chinese Wall, representing so much labor and time, are almost as nothing.

Thirty-eight states alone have a total of work now under contract of nearly $260,000,000. This is aside from any city, county, township or improvement board work.

The work by states actually under contract, is as follows:

Alabama	$8,584,000
Arizona	1,270,000
Arkansas	625,000
California	1,343,000
Colorado	8,345,000
Delaware	2,600,000
Idaho	2,175,000
Illinois	23,400,000
Iowa	9,000,000
Kentucky	1,000,000
Louisiana	2,000,000
Maine	8,500,000
Maryland	4,265,000
Massachusetts	1,358,000
Michigan	13,836,000
Minnesota	1,200,000
Mississippi	6,000,000
Missouri	29,233,000
Nebraska	1,218,000
Nevada	300,000
New Hampshire	100,000
New Jersey	8,500,000
New Mexico	300,000
North Carolina	37,497,000
North Dakota	1,800,000
Ohio	30,000,000
Oklahoma	600,000
Oregon	1,335,000
Pennsylvania	12,259,000
Rhode Island	887,000
South Carolina	6,023,000
South Dakota	350,000
Utah	1,000,000
Vermont	600,000
Washington	3,000,000
West Virginia	15,000,000
Wisconsin	9,000,000
Wyoming	4,900,000

—National Sand & Gravel Bulletin.

JIM'S REMARKS

When the report of personal injury sustained by a teamster at the road construction camp came to the main office it was turned over as was customary to the boss for his consideration. The blank form provided for reporting accidents was properly filled in as follows:

Nature of Accident—Toe crushed.

Name of Man—Jim Kelly.

How Caused—Horse stepped on his foot.

Remarks—You know Jim. The sooner his remarks are forgotten the better for all concerned.

Lincoln Highway in Echo Canyon to Be F. A. P.

(Continued from Page 1)

fall upon the shoulders of the people in the counties involved in such instances, but to expect them to construct and maintain roads that will carry the increasing volume of interstate traffic in safety and comfort appears to the commission not only unjust, but manifestly impossible in the face of the excessive taxation now prevalent.

Some criticism of the state roads has appeared in the press with particular reference to the Echo canyon road, and the complaint has been made that the state constructs roads where there are the most votes.

We freely admit that this is true.

Road improvement with federal aid, which covers all the construction the commission is now undertaking, must be initiated by a cooperative agreement between the state and the county units and a county has, as a rule, not much to spare upon a road that flanks the outposts of its population. A legislative appropriation of $25,000, reinforced with some splendid donations from sources outside the state, has enabled the commission to begin the construction of a project that will involve the expenditure of half a million dollars on a road similarly situated in the western part of the state and in a desert location where a chemical analysis might disclose a trace of votes.

The commission stands ready and willing to discharge its obligations in constructing and maintaining the state highways wherever and whenever the necessary means are available, but it appears evident that until a greater degree of state control of the distribution of the funds for this purpose can be had the state roads will continue to be, in name rather than in fact, a state road system.

Status of Federal Aid Projects

(Continued from Page 2)

was recently completed by Jos. M. Tracy. This location eliminates seven grade crossings and will include the construction of one underpass.

F. A. P. 65.

Orem-Wasatch Co. line via Provo canyon; 9.5 miles gravel. The location survey of this project was recently completed by Mr. Wendelboe, locating engineer. Two alternate lines were run—one on the north and the other on the south side of the canyon. The plans and estimates will not be worked up until further investigations are made with the bureau engineers to determine which line is the best suited to meet all conditions of grade, alignment and snow conditions.

F. A. P. 66.

Parowan-Winn Hollow; 6.0 miles gravel; Iron county. The survey of this project has recently been completed by G. A. Gregory and plans will be prepared during the winter for its construction next season.

F. A. P. 67.

Scipio-Holden; Millard county; 12.0 miles gravel. This project connects up with the two federal aid projects Nos. 17 and 9.

F. A. P. 72.

Devil's Gate-Weber; Davis county. This project extends from the Devil's Gate wagon bridge to the Weber county line. This includes a piece of road in Weber canyon which is badly in need of improvement.

Proposed New Work

F. A. P. 68.

Dog Valley-Beaver; Millard county; 8 miles gravel. The location survey on this project has not started.

F. A. P. 69.

Wild Cat-Millard Co. Line; Beaver county. This project extends from the north end of the Wild Cat canyon, Federal Aid Project No. 26, to the Millard county line, connecting up with F. A. P. 68. It will be gravel surfaced and about 5 miles in length.

F. A. P. 70.

Nephi-Levan; Juab county; 9.5 miles. This is a proposed gravel surfaced project between Nephi and Levan connecting the concrete surfaced project No. 53, now under construction in Nephi City, with the gravel surfaced Project No. 17 between Levan and Scipio.

F. A. P. 71.

Uintah River Bridge; Uintah county; 100-foot steel truss. This project will cover a structure over the Uintah river east of Fort Duchesne in the Ouray Indian reservation and will be a 100% federal aid participation in costs. The project statement was recently submitted to the bureau of public roads, approval of which has not yet been received.

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HOOPER CONCRETE HIGHWAY
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HIGHLAND DRIVE HIGHWAY
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FOR RATES AND PARTICULARS

—and now the Cat is out of the Bag!

The Gasoline War Concerns Every Motorist—

The Tom Cat has finally been smoked out—he wasn't satisfied to stay in the background and rob the producer, the refiner and the jobber—he has now come out in the open in a deliberate attempt to eventually rob the public.

"Greed" is the watchword of the oil monopoly—they must have their own way—they must have the road clear of legitimate competition—no obstacle must stand in the way of the ultimate aim of robbing the public by higher gasoline prices than ever before.

Regardless of their OWN statements in their OWN advertising—the oil monopoly has spared neither money nor effort in fighting the Independent companies—their terrific overhead caused by their insane desire to have pumps on every corner, service stations in every available location, simply to crush competition, IS BORNE BY THE PUBLIC and it's high time for some action to be taken—to find out whether or not a monopoly is bigger than the Government itself.

This is your FIGHT—as much as OURS. It's a question of whether you want a monopoly to fix the price of your gasoline, with competition in the future as before the Independent Gas and Oil Company entered the field or whether you want to throw off the shackles of this monopoly and have the petroleum industry in the hands of men you KNOW to be conscientious in their endeavors to serve your best interests.

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The truly Independent displays this insignia. It's the emblem of fair dealing and honest goods and the emblem you should be sure to look for on every service station. By supporting the Independents now you are helping to stamp out the "Greed" and "Selfishness" of MONOPOLY.

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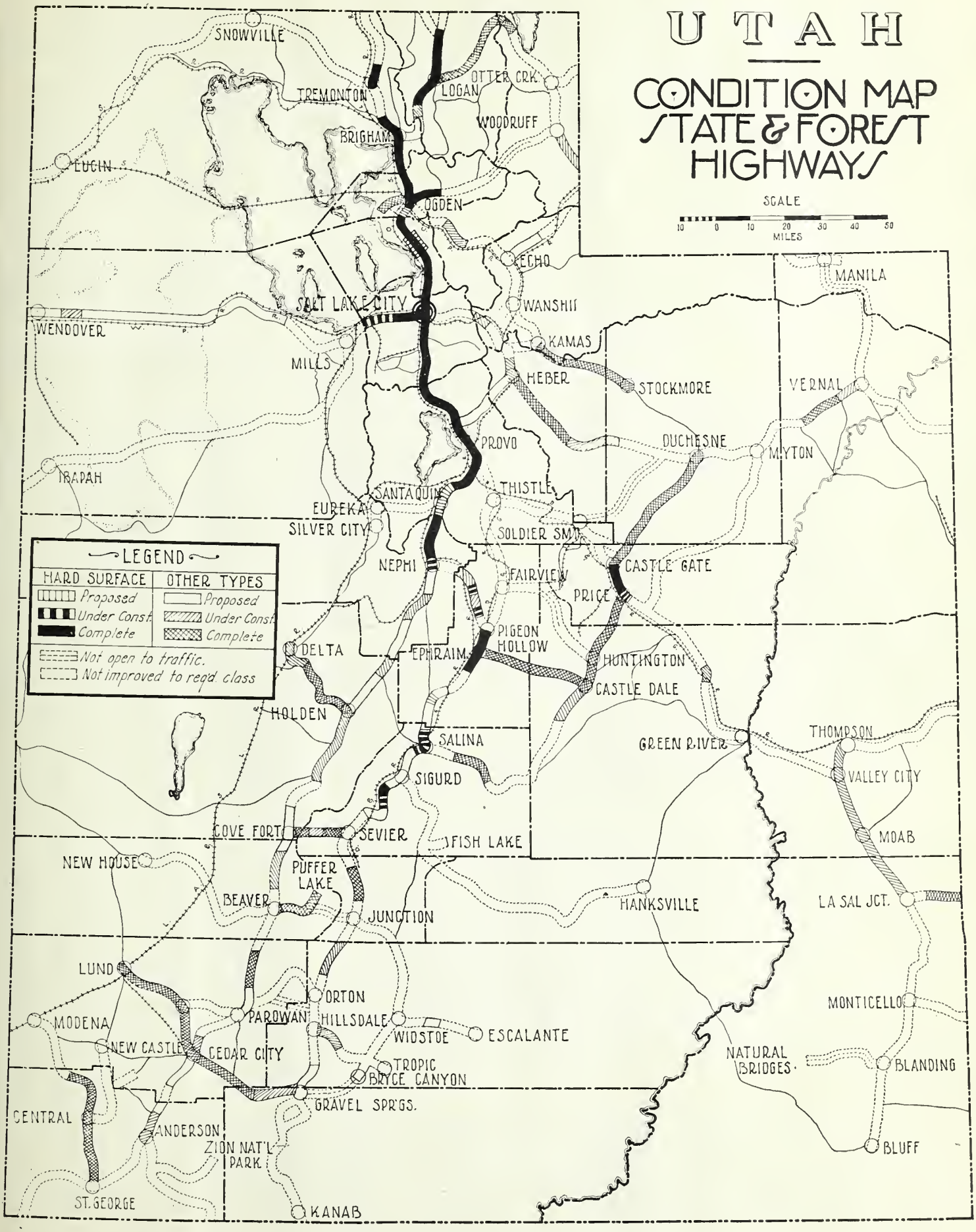
UTAH
CONDITION MAP
STATE & FOREST
HIGHWAYS
SCALE
10 0 10 20 30 40 50
MILES
LEGEND
HARD SURFACE
OTHER TYPES
Proposed
Under Const.
Complete
Proposed
Under Const.
Complete
Not open to traffic.
Not improved to reqd. class
SNOWVILLE
TREMONTON
LOGAN
OTTER CRK.
WOODRUFF
BRIGHAM
LUCIN
OGDEN
ECHO
MANILA
SALT LAKE CITY
WANSHIP
WENDOVER
KAMAS
MILLS
HEBER
STOCKMORE
VERNAL
PROVO
DUCHESNE
MYTON
IBAPAH
SANTAQUIN
THISTLE
EUREKA
SILVER CITY
SOLDIER SMT.
NEPHI
FAIRVIEW
CASTLE GATE
PRICE
PIGEON HOLLOW
DELTA
EPHRAIM
HUNTINGTON
CASTLE DALE
HOLDEN
SALINA
GREEN RIVER
THOMPSON
SIGURD
VALLEY CITY
COVE FORT
SEVIER
FISH LAKE
MOAB
NEW HOUSE
PUFFER LAKE
BEAVER
JUNCTION
HANKSVILLE
LA SAL JCT.
LUND
ORTON
MONTICELLO
MODENA
PAROWAN
HILLSDALE
WIDSTOE
ESCALANTE
NEW CASTLE
CEDAR CITY
TROPIC
NATURAL BRIDGES
BLANDING
BRYCE CANYON
GRAVEL SPR'GS.
CENTRAL
ANDERSON
ZION NAT'L PARK
BLUFF
ST. GEORGE
KANAB

1923 Adds Big Mileage to Federal-Aid Roadways

BALLOON TIRES—FOR AND AGAINST

Discussion of the large section, thin wall (balloon) tire is becoming so common among automotive engineers—the doctors who prescribe for the motoring public—that the prophets of the industry who predict their widespread use are beginning to be believed in their own land. How the public stands on the question cannot be determined until some manufacturer steps from the ranks of the conservatives and standard-equips his product with balloon tires.

In the meantime, we cull the following "pros" and "cons" from the increasing mass of experimental reports and opinions on the large section tire:

Advantages

Greatly increased riding comfort. They smooth the road by "swallowing" the bumps, completely eliminating vibrations due to the smaller inequalities of pavement, such as cobblestones, brick, etc.

They give greater tractive and braking effects.

By eliminating vibration they prevent motor and chassis deterioration due to this cause.

Disadvantages

At high speeds they puncture more readily than small section, thick wall tires.

They steer harder and cause greater tilt of the car when flat.

They consume more horsepower, which means less mileage per gallon of gasoline, loss of pick-up and hill-climbing ability, and less speed. (One engineer conducting a dynamometer test with a 34x7 4-ply balloon tire inflated 30 lbs. per square inch and a 33x5-8-ply cord tire inflated at 65 lbs. found a horsepower consumption of .94 for the balloon tire and .71 for the cord at 25 miles per hour).

Very slight misalignment of wheels causes rapid wear.

At high speeds they increase the tendency of certain cars to "weave," and in other cases cause slight weaving.

They greatly increase mud-spattering and dust-raising.

At excessive speeds they distort by centrifugal force, causing a "wave" motion in the car.

Economic effects of a rapid shift to balloon tires might prove serious, involving radical changes in automobile design, and reducing the production capacity of tire factories, vulcanizing machines, etc., both of which would be reflected in higher costs.

While the "for" reasons are numerically inferior to those "against," riding comfort places a tremendous weight in the scales and the general trend of thought, if any can be accurately sensed, seems to be favorable, or at least open minded, on the balloon tire question. The acid test will be made by the public, just as in the case of the parts you replace. It might be wise to remain neutral on the balloon tire question for a while.—Georgia Highways.

Federal-aid roads totalling 8,820 miles were completed during the fiscal year ending June 30, 1923, bringing the total of federal-aid roads completed to 26,536 miles. The mileage completed during the year is classified as follows:

Type	Miles
Graded and drained	1860.1
Sand-clay	749.5
Gravel	3815.4
Waterbound macadam	335.6
Bituminous macadam	452.9
Bituminous concrete	76.8
Concrete	1440.3
Brick	78.3
Bridges	10.8
	8820.2

The projects under construction at the close of the year amounted to 14,772 miles and were estimated as 55 per cent complete. In addition to the 26,536 miles completed and the 14,772 miles under construction there were at the close of the year a number of projects approved but not yet placed under construction, the aggregate length of which was 6,917 miles.

A summary of what has been accomplished in the construction of federal-aid roads is given in the table below wherein the total cost and mileage of the various types completed and under construction 1916 to June 30, 1923, together with the percentages of the corresponding totals, are listed:

Type	Total Cost	Per Cent of Total Cost	Mileage	Per Cent of total Mileage
Graded and Drained	$ 68,702,937.73	9.4	8,686.7	21.1
Sand-clay	32,008,876.39	4.4	4,224.3	10.2
Gravel	160,980,863.16	22.0	15,593.2	37.8
Waterbound macadam	25,776,347.24	3.5	1,375.0	3.3
Bituminous macadam	74,127,824.51	10.1	2,450.8	5.9
Bituminous concrete	35,430,764.71	4.8	1,029.7	2.5
Concrete	283,258,479.98	38.7	7,285.6	17.6
Brick	26,669,415.81	3.7	591.9	1.4
Bridges	24,743,710.95	3.4	71.1	.2
Total	$731,699,220.48	100.0	41,308.3	100.0

F. A. Roads Designated in Thirty-four States

Roads that will comprise the federal-aid system of highways have been definitely designated in 34 states, according to the bureau of public roads of the United States department of agriculture.

A study of the system in the 34 states now approved shows some interesting facts. Nearly every city of over 5,000 population is located upon it and the few that are not will connect with it over improved roads. Indications are that over 90 per cent of the entire population of the United States will live within 10 miles of a federal-aid highway. In a number of states the figure is as high as 98 per cent and in none of the states will it drop below 65 per cent.

The following tabulation shows the mileage in the system by states, estimates being given for those states whose systems are not yet approved:

	Federal Aid System
Alabama	3958*
Arizona	1498
Arkansas	5037*
California	4467
Colorado	3360
Connecticut	835
Delaware	266
Florida	1855
Georgia	5662*
Idaho	2772
Illinois	4987*
Indiana	3957
Iowa	7154
Kansas	6423
Kentucky	3250
Louisiana	2667*
Maine	1393
Maryland	1036
Massachusetts	1290*
Michigan	4582
Minnesota	6801
Mississippi	3290*
Missouri	7040
Montana	4697
Nebraska	5500
Nevada	1456
New Hampshire	988
New Jersey	983
New Mexico	3258
New York	4498
North Carolina	3816
North Dakota	4855*
Ohio	4506
Oklahoma	7889*
Oregon	2814
Pennsylvania	3954
Rhode Island	165
South Carolina	3179*
South Dakota	8077*
Tennessee	4564*
Texas	11655*
Utah	1430
Vermont	1043
Virginia	3016
Washington	2887
West Virginia	1901
Wisconsin	5516*
Wyoming	3234
Total	187,406

*Mileage given is an estimate, as system is not yet approved.

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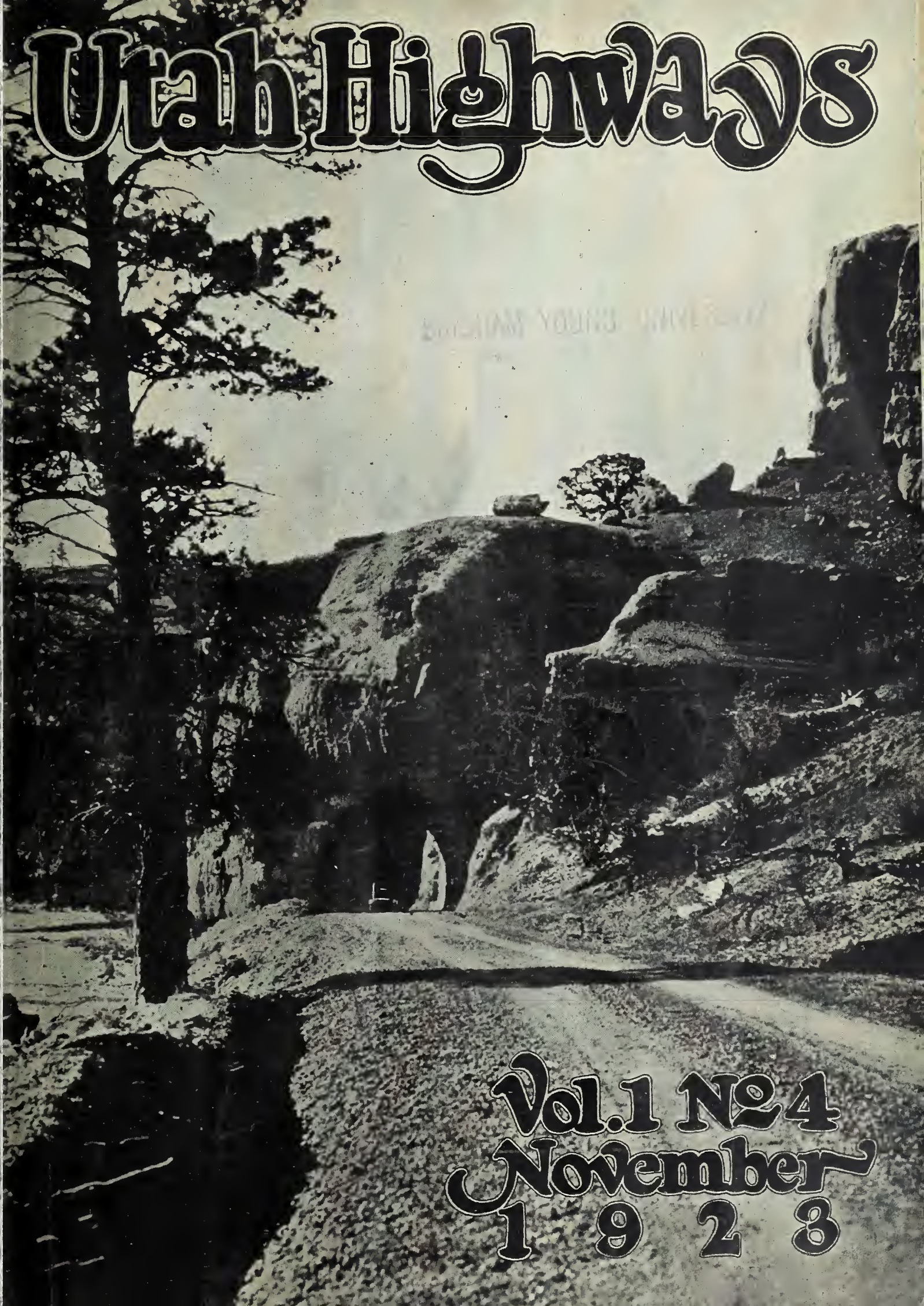

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November
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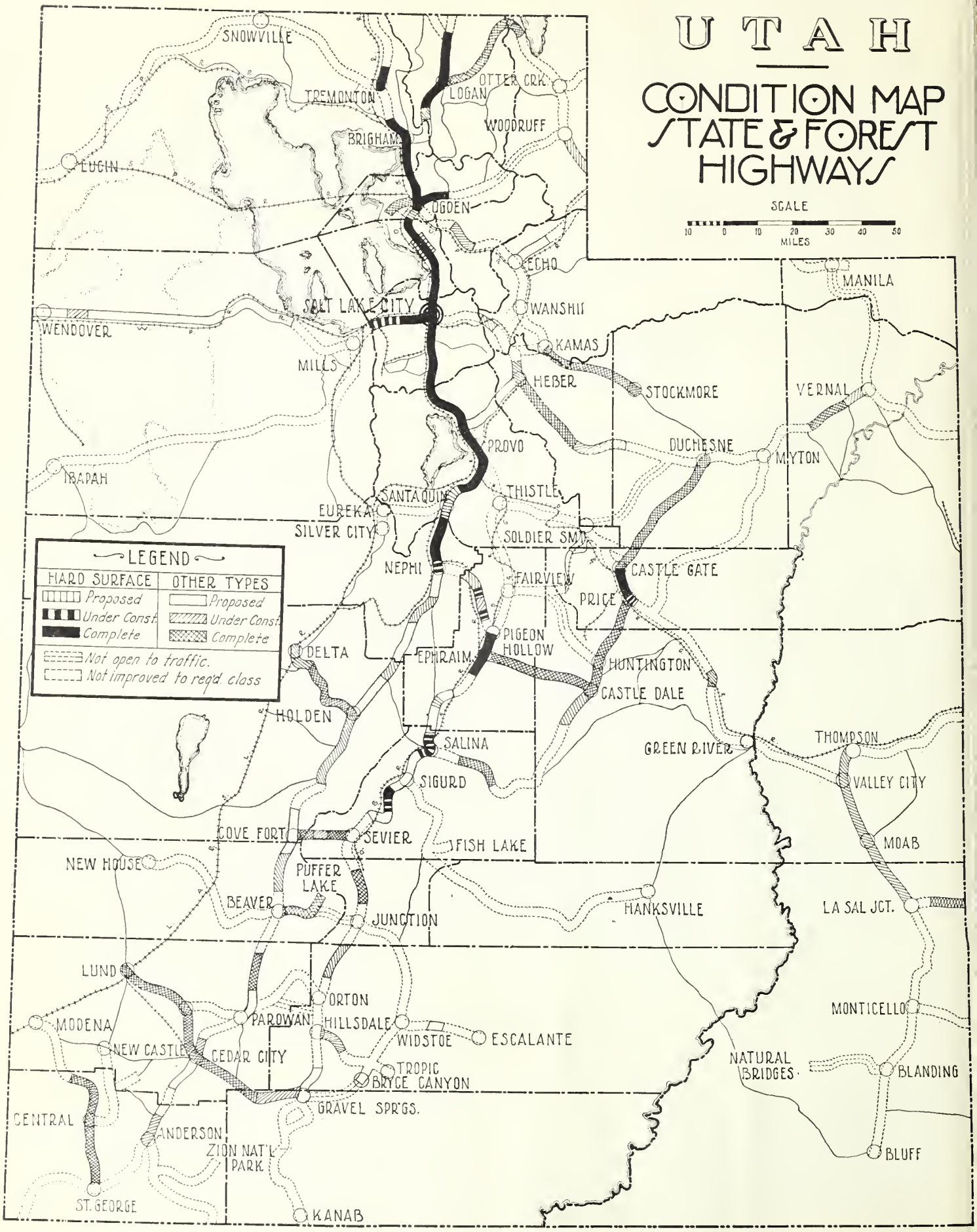
UTAH
CONDITION MAP
STATE & FOREST
HIGHWAYS
SCALE
10 0 10 20 30 40 50
MILES
LEGEND
HARD SURFACE
Proposed
Under Const.
Complete
OTHER TYPES
Proposed
Under Const.
Complete
Not open to traffic.
Not improved to reqd. class
SNOWVILLE
TREMONTON
OTTER CRK.
LOGAN
WOODRUFF
BRIGHAM
LUGIN
OGDEN
ECHO
MANILA
SALT LAKE CITY
WANSHIP
WENDOVER
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SEVIER
FISH LAKE
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Utah Highways

VOLUME 1. NOVEMBER, 1923. NUMBER 4.

Fourteen Years of State Road Building

The volume of the people's business in the construction and maintenance of state roads in Utah has grown from its inception in 1909 to include an annual expenditure in excess of two million dollars. The exact figures from 1909 to November 30, 1922, the close of the last fiscal year, show total expenditures of $16,584,401.79 and there remained in the state treasury on that date a balance of $558,393.60 credited to the road commission.

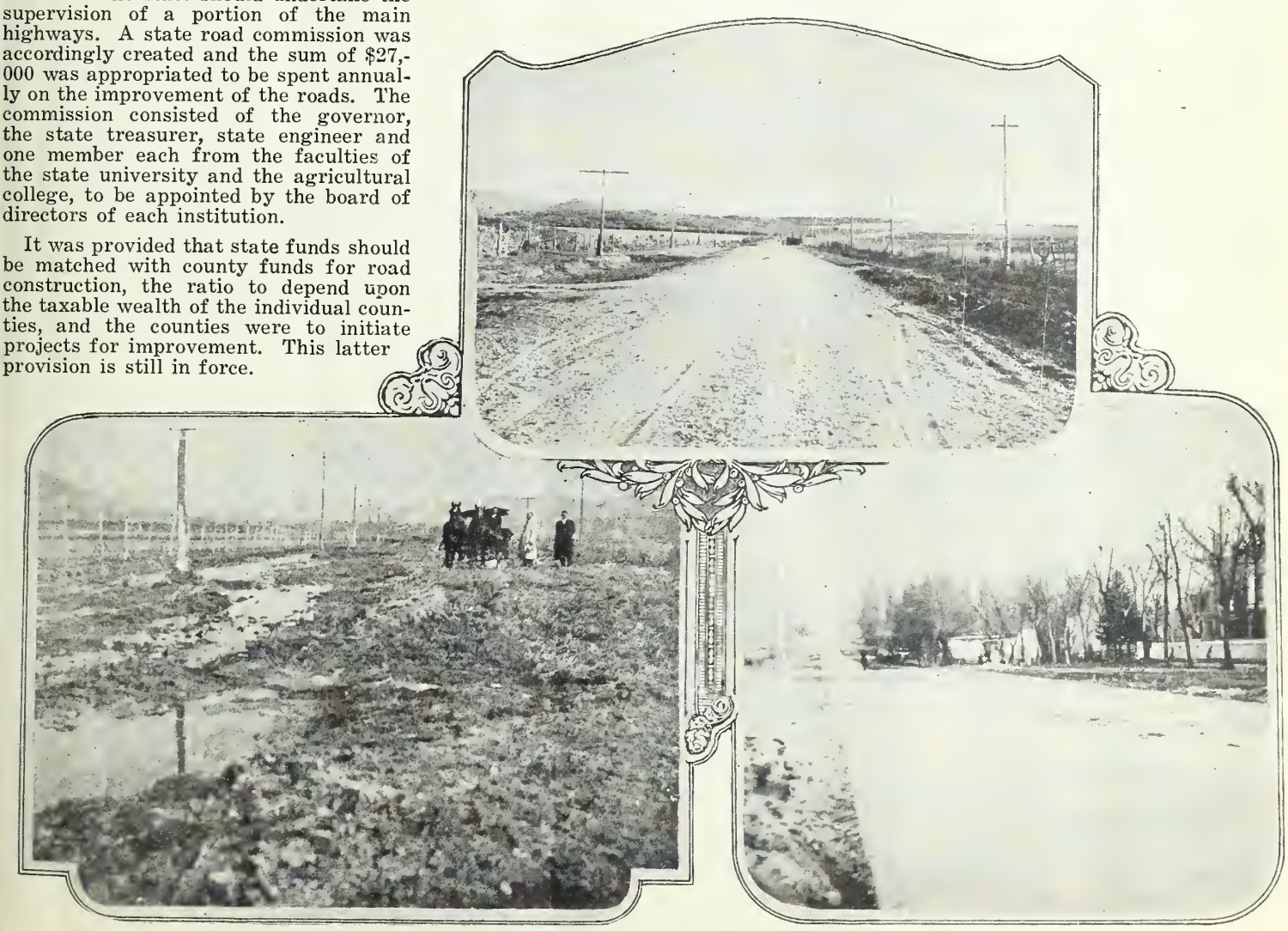
It was the opinion of the legislature in 1909 that the state should undertake the supervision of a portion of the main highways. A state road commission was accordingly created and the sum of $27,000 was appropriated to be spent annually on the improvement of the roads. The commission consisted of the governor, the state treasurer, state engineer and one member each from the faculties of the state university and the agricultural college, to be appointed by the board of directors of each institution.

It was provided that state funds should be matched with county funds for road construction, the ratio to depend upon the taxable wealth of the individual counties, and the counties were to initiate projects for improvement. This latter provision is still in force.

With these provisions in mind and with this sum to work with, the newly created commission proceeded to plan a connected system of state roads and requested of each county a map showing all the county roads with a special designation for those of primary importance. All of the counties had furnished these maps by the spring of 1910 and from these the commission selected a system of state roads which with very little variation comprises the present system. All of the principal through highways are on the state road system which, with some branches and connections has a total of 3000 miles. The total state and county road mileage is 24,000.

The first commission attempted no elaborate construction program, it had no engineering department and its first efforts at road improvement were in the nature of first aid.

A picture on this page, taken A. D. 1910, shows a team attempting to negotiate the road between Moroni and Fountain Green. The commissioner states in his report that straw and other material had been placed on the road in order to



Moroni-Fountain Green road in 1910 and the paving and gravel surfacing now under construction

make it possible for teams to get through the mire. As an initial improvement this road was bladed and dragged and some drainage was attempted at a cost, the record shows, of $822 per mile. The grading and gravel surfacing of the same road, now under construction as Federal Aid Project 47-B, at a cost of $7,000 a mile, is also pictured as well as the paving in Moroni, in the same contract, to cost $33,000 a mile.

The influence of the automobile and the reason for the gasoline tax is reflected in this comparison of the costs of road building then and now. Very few cars were experimenting with Utah roads in 1910 while the number of motor licenses issued this year is over 65,000 and 25,000 tourist cars visit the state annually.

As the first improvements on the state road were accomplished without the services of the sometimes maligned surveyor, the roads were not built to line and grade and one of the first supervisors on construction writes after grading a few miles "I never noticed before that this road is not straight and that its grade is not uniform."

The first commission suggested to the legislature of 1911 that an engineer be provided to supervise surveys, plans and construction; also that the annual appropriation be increased to $60,000 and that funds be provided for paying the expenses of the commission. All this was done and it is indicative of the awakening interest in good roads that this legislature authorized a bond issue of $260,000 to further aid in the upbuilding of the road system.

The report of the engineer for 1912 shows that it had proved wasteful to attempt to make the earth road serve the traffic requirements of the more thickly settled portions of the state and an extensive gravel surfacing and for some roads, concrete pavement, was recommended. Standard designs had been prepared for box culverts and the smaller bridges, the materials to be of steel, stone masonry with cement joints, or concrete, and were then being used to replace the wooden culvert and the wooden bridge.

The first concrete pavement was laid on a state road in 1912 south of Garland, a 9-foot strip, and it is still in service, although it has since been widened to 18 feet. There are now 220 miles of hard surface pavement on the state roads and over 500 miles are gravel surfaced. The remainder of the system is graded earth except for 100 miles which have not been improved. This statement of mileage does not by any means tell the full story of the activities of succeeding commissions as a large mileage has been graded and then regraded and widened, later gravel surfaced, and some of it finally paved.

Additional funds for state participation in construction and maintenance were obtained through the motor vehicle license law, passed in 1915, but the most rapid strides in road development have been made through the funds provided by state road bond issues authorized by the legislatures of 1917, 1919 and 1921 in the amounts of $2,000,000, $4,000,000 and $1,000,000 respectively.

In 1917 a modification of the law respecting the organization of the commission devolved the duties of road supervision upon the governor, secretary of state, state auditor, attorney general and the state engineer, and this statute continued in force until 1921 when the present three-member form of commission, appointed for six-year terms, serving on salary, and occupied solely with the development of the state highways.

The state has cause for congratulation in the progress that it has made in the improvement of its highways, distributed as they are over an area fifty per cent of which still forms a part of the public domain where roads connecting widely separated towns may pass for miles through country sparsely settled or wholly uninhabited.

It is due to this feature that the road problems of Utah are distinct from many states where the factors controlling location are frequently outside the province of engineering.

The character and volume of present-day transportation and the high cost of road improvement has and will continue to make a close study of topographic fea-

(Continued on Page 9)

More than sixty miles of hard surfaced roads were built in 1920

Pavement Near Magna Undermined by Flood

Flood damage on Magna pavement

The devastating floods in Davis and Box Elder counties this summer have overshadowed many smaller floods which under ordinary conditions would have been given some publicity. One of these occurred near Magna in September, the result of a heavy rainfall of short duration.

A small creek, ordinarily dry, about one mile east of Magna, passes under the state road through a 36-inch corrugated iron pipe. The freshet referred to quickly blocked the culvert with fence posts, brush, and other debris and the roadway was soon covered to a depth of two feet. A drop-off from the north shoulder into the creek channel gave the water a chance to cut and the pavement was undermined, the water cutting away six feet or more of the underlying subgrade and leaving the pavement bridged over a distance of between forty and fifty feet.

A peculiar feature of this flood is that it was several hours before the damage was discovered and the heavy traffic of 33rd South street detoured, the pavement in the meantime sustaining the loading with injury.

A lesser flood at the same point the year previous caused some damage and to obviate further trouble the highway department is now constructing a 12x10 feet concrete box culvert to replace the 36-inch pipe and this will doubtless prove entirely adequate to carry future flood waters.

The pavement is 6 to 8-inch concrete, 18 feet wide, and was constructed by Alston & Hoggan in 1920.

Great Britain taxes automobiles at the rate of one pound sterling per horsepower for all passenger cars, at the minimum rate of $30.00. A Ford tax is over $100.00. A card must at all times be worn on the person of the driver.

NATIONAL FOREST ROADS

MOUNT TIMPANOGOS SECTION OF ALPINE HIGHWAY COMPLETED

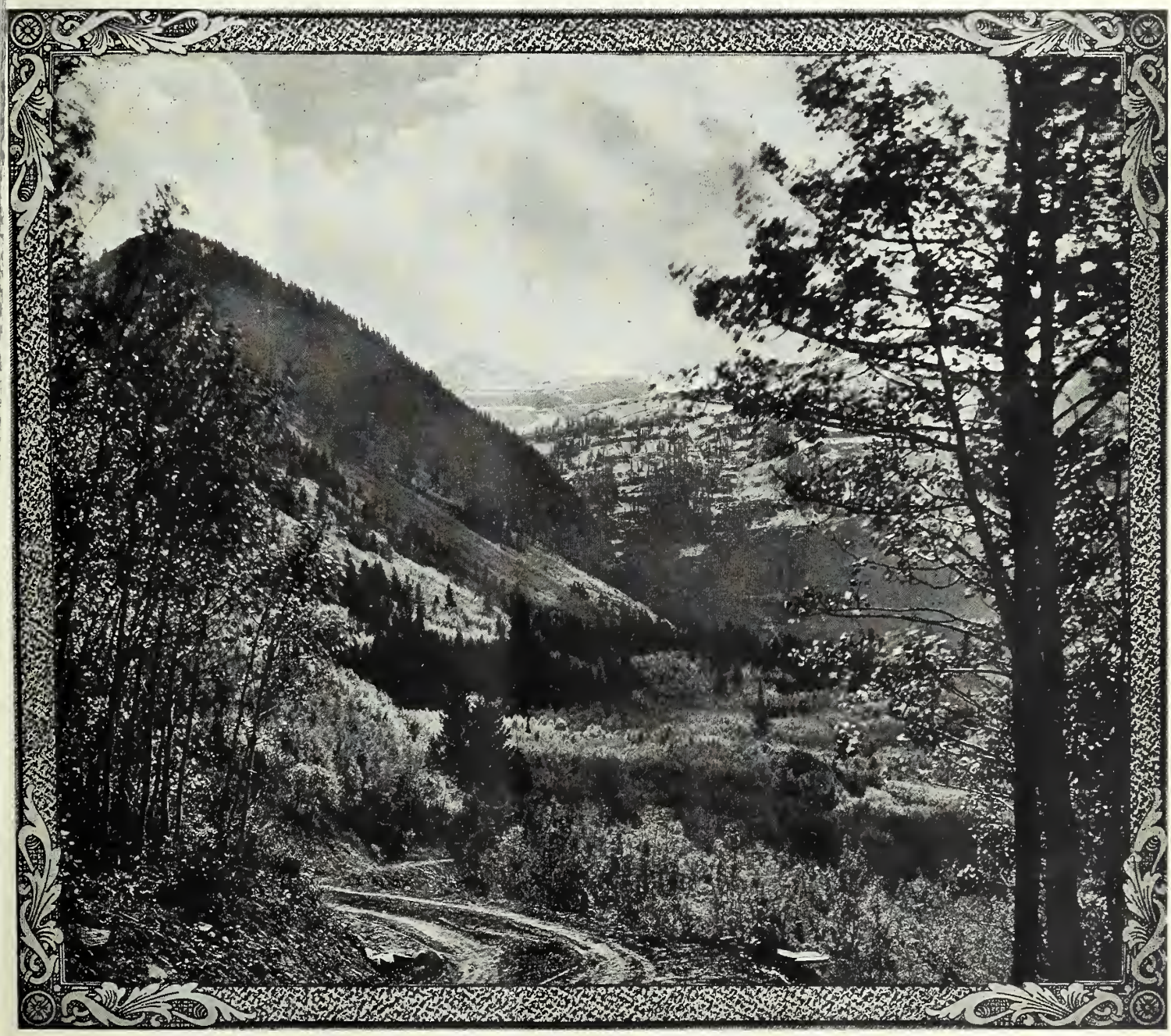
The American Fork-Provo Canyon loop of the Alpine scenic highway has been completed and opened to traffic this season. Beginning in American Fork canyon the road encircles the easterly slopes of Mount Timpanogos to the summit of the divide, then drops to Aspen grove and to Provo canyon by way of North Fork.

This marks the completion of the first unit of a scenic drive among the peaks of the Wasatch range to be built by the forest service in cooperation with Utah and Salt Lake counties which will link together, when completed, five of the canyon roads entering the Wasatch mountains from the forty miles of paved state road between Salt Lake City and Provo.

When completed the road will lead from the Lincoln highway in Parleys canyon and south over the first summit by way of Lamb's canyon to Brighton in Big Cottonwood canyon, from Brighton to Wasatch in Little Cottonwood canyon, thence to American Fork canyon, where it will connect with the completed loop.

The bureau of public roads has announced, October 15, the completion of the survey for the connection of Parleys canyon with Brighton, a distance of 14 miles. Some difficult location has been encountered in holding to a maximum grade of 5%. Seven miles of the present road in Lamb's canyon will be used but it is the intention to relocate through this canyon later and reduce the grades.

The Mount Timpanogos drive has uncovered for motorists some of the most beautiful scenery to be found in the west. The road winds among forests of aspen and pine where there is an abundance of springs of pure, cold water and ample grounds for campers and picnic parties. A wide expanse of rugged mountain scenery hitherto accessible only by difficult hiking and climbing is brought within easy reach of the most populous section of the state. The road in American Fork connects with the trail to the cave in Mount Timpanogos and in surmounting the divide connects with both trails to the summit. A close view of the waterfalls on this mountain and its glacier,



Alpine Scenic Highway above North Fork of the Provo with Mt. Timpanogos in distance

the only one in Utah, can now be had by motorists.

The cave was discovered in August, 1920. It has since been proclaimed a national monument and is under the charge of the forest service. An excellent trail has been constructed to the entrance, which is 1200 feet above the camping grounds in American Fork canyon. A well arranged electric lighting system fully displays the remarkable formations in the cave and guides are provided by the forest service.

The summit of the mountain, 12,000 feet in elevation, is usually approached on the glacier side by a trail 5½ miles in length leading from Aspen grove. A portion of the descent can be made via the glacier—a slide of one-half mile effected with speed and safety and more or less grace brings the visitor to the foot of the ice field.

RED CANYON AND BRYCE CANYON PROJECTS

(See Cover Picture)

The road leading from the junction with the Grand Canyon highway to Bryce canyon, eighteen miles, has been greatly improved during the past summer by the completion of two forest projects, Red canyon and Bryce canyon. The former canyon covers the first seven miles from the junction and the latter five miles of what was previously some rather tough going above Red canyon and near the formation in Bryce canyon.

The upper section has been completed and approved and the Red canyon section, of which a picture is shown on the cover of this issue, is 95 per cent complete. The bridges, one of which will span the Sevier river, are 50 per cent complete. The roadway is 14 feet wide, gravel surfaced in part and with the ruling grades and curvature offers a safe and easy ascent from the main highway to the scenic wonderland in Bryce's.

The Red canyon road itself extends through a remarkably picturesque region, both sides of the canyon are surmounted with towering cliffs of a deep red sandstone, several spurs of which are pierced by the road as it winds to the summit.

ROAD TO DEVELOP GRANDADDY LAKE BASIN

To many who have visited the Grandaddy lakes and wondered at the extent and quality of the forestation, the blaze of Alpine floral display, and enjoyed an outing in this fisherman's paradise, it will come as a pleasant surprise that this region will soon be accessible to the automobile. A road beginning at Kamas and extending into the basin is under construction and eighteen of the 35 miles in the project were built during the past summer and are open for traffic from Kamas to the Soapstone ranger station.

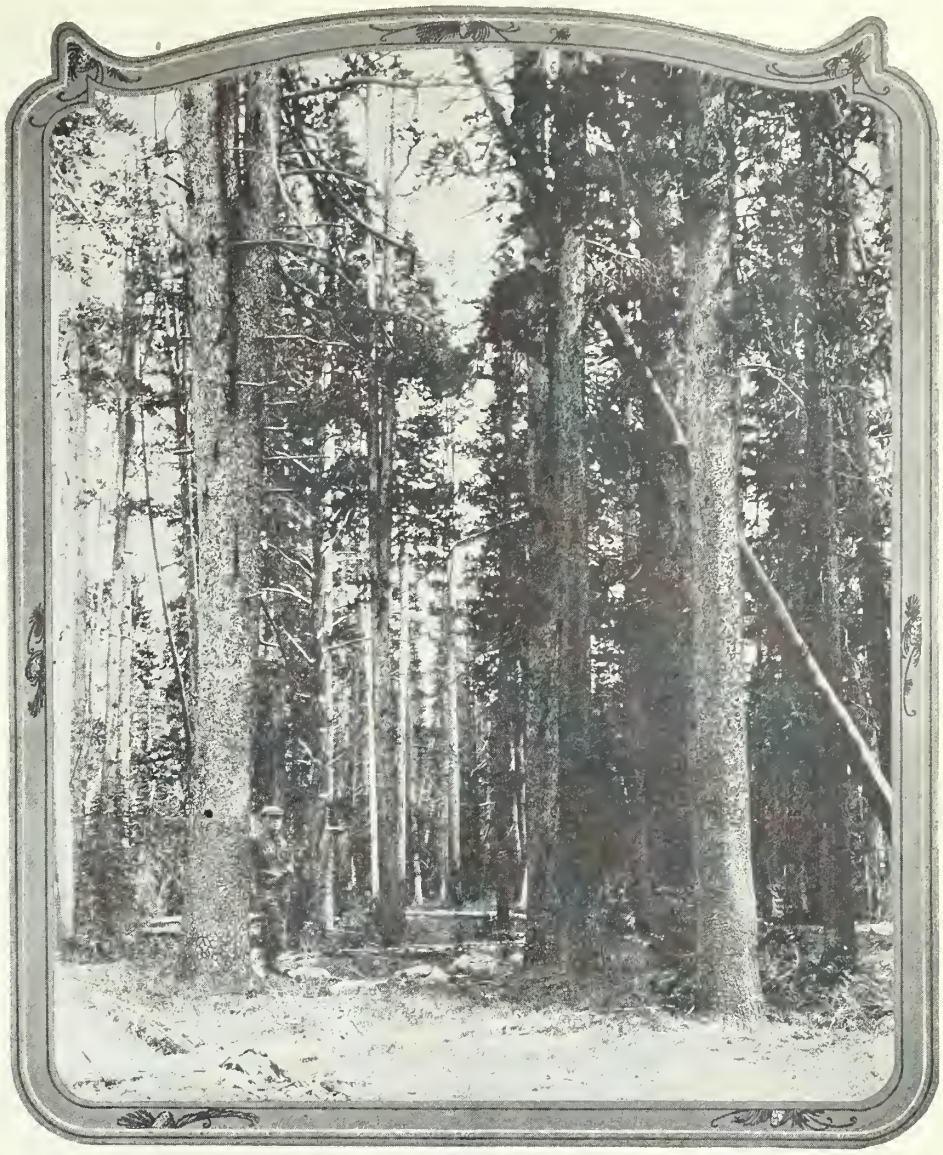
Forest development has made such a road necessary and a region approximately ten miles wide by twenty in length will supply indefinitely under the forest regulations the timber required for the operation and development of the mines in the Park City district. A further extension of this road is planned which, when funds are available, will result in a new interstate route for Utah and Wyoming. The project will include the construction over the Uintah moun-

Mirror Lake, one of the many in Grandaddy Lake Basin

ains divide and down the Hayden fork f the Bear river and thence to the Wyming line, where Uintah county in Wyming will meet it with a road up the Bear river from Evanston. The divide rossing is at an elevation of 10,700 feet ut the grades will at no place be in xcess of 6%. The Wanship-Kamas road, vith its branches to Provo, Salt Lake City and Ogden, will then offer during he summer months a route through a beautiful mountain region hitherto accessible only to pack trains.

Some idea of the rugged nature of this region may be gleaned from the fact that in the mountains surrounding the basin are eighteen peaks which tower well above 12,000 feet; one of these, Mt. Lovenia, has an elevation of 13,250 feet.

From the summit crossing into the basin scores of lakes can be seen dotting the surface of this upland forest and it is from the largest of these Grandaddy lakes, about 200 acres in expanse, that the region, which is part of an extensive glaciated area, takes its name. Many of these lakes, although formed by a setting of great beauty, have no name, while others have various appropriate titles such as Shadow Lake, Mirror Lake, Lily Lake. The distinction of Grandaddy lake is not clear, it may be because it is the largest, but the story persists that an early visitor gazing in rapt astonishment at this sylvian panorama was moved to amplify the expletive, Oh, daddy! and so the entire basin and then this lake in particular, came to be so designated.



Character of the timber to be made accessible by road to Grandaddy Lakes

Highway Departments Make Many Changes

Highway departments of fourteen states have either been reorganized or the management of their affairs are under new direction as the result of the action of the legislatures or a change in the state administration, according to the study of state highway activities being made by the good roads board of the American Automobile association. This big turnover in management of state highway departments does not take in consideration the changes which occurred during 1922 and the years preceding, but represents the legislative or political products of three and one-half months of 1923. When it is considered that these departments have the expenditure of from $2,000,000 to $40,000,000 annually under their direction, the economic loss resulting from the frequent changes in administration with the corresponding changes in policy is appalling, points out H. G. Shirley, chairman of the good roads board of the American Automobile association.

The good roads board recognizes that changes in personnel and plan of administration of state highway departments are sometimes advisable, just as changes are advisable in private business, said Mr. Shirley. Any changes made should be made on sound business principles looking to the efficiency and economy of administration rather than through political expediency, as seems to be indicated in the record of some of the recent turnovers in state highway administration.

The changes made in state highway departments in 1923 vary from the usual change of the chief executive of the department with the incoming administration, to a complete reorganization of a state highway department along entirely different lines. In one state after May 1 there was left only one assistant draftsman of the old organization. All of the heads of the departments, and even minor employes were asked for their resignations. In another state widely separated from the first, the entire personnel of the directive heads of the organization were relieved from further duty by legislative enactment and a new form of administration substituted. This is the second complete change in four years in this state.

If a corresponding high percentage of private business concerns of similar magnitude were subjected to a like turnover in management, Mr. Shirley declares, the results would be so disastrous to business generally as to demand on the part of business the immediate remedy of this situation. It is pointed out that business concerns having the expenditure of amounts as large as those entrusted to state highway departments, for reasons of economy and efficiency, must plan their work ahead for a period of five, ten and twenty years. The difficulties in applying this well known rule of business to the administration of a state highway department will be appreciated when fourteen out of forty-eight states changed either personnel or plan or usually both in three months. The average term of office of a state highway executive is two and one-half years, according to the statement of a well known state highway official.

The observations which have been made by the good roads board of the American Automobile association emphasizes the necessity of close cooperation between the motorist who is interested in highway improvement and the state highway departments. It is the opinion of Chairman Shirley that the frequent changes in personnel and plan of administration is largely due to lack of understanding on the part of the public of the plans of the department and just how the state's money is being expended for construction and maintenance of highways. It is the belief of the board that the motorists through the organized efforts of their clubs can materially help in building up public confidence in their state highway departments.

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Volume 1 NOVEMBER, 1923 Number 4

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H. V. RICHARDS, Editor

REDUCTION OF GRADE CROSSING ACCIDENTS

This month should witness the close of the long drawn-out preliminaries to the construction of the Riverdale viaduct. Bids are to be opened November 13 for the construction of the earth fill approaches and the steel bridge across the Weber river and the railroad is ready to proceed with the construction of its portion of the viaduct which will include the erection of a steel span across its double track east of the river. A number of other grade separation crossings are under consideration, and one, the underpass at Price, will be placed under construction as soon as the Public Utilities commission has determined the proportion of the railroad's share of the cost.

It is the policy of the commission and the Federal Bureau of Public Roads to locate the highways on the seven per cent system with the view of eliminating railroad crossings wherever this is economically feasible. When a crossing is unavoidable a grade separation is effected or the road is so located that such a crossing may be built with future appropriations at a reasonable cost and with minimum changes in existing alignment. Examples of grade crossing elimination by road relocation are: Levan-Juab, construction costs increased but two main line crossings avoided; Payson-Spanish Fork, road constructed to the west of the town of Salem but an extensive through traffic is spared the hazards of four former crossings of an electric interurban line; the relocation in Echo canyon will eliminate in a distance of eleven miles six main line grade crossings and one on a branch line, one underpass will be required.

It will never be possible to eliminate all grade crossings, even on the principal highways, and a continual campaign of educating motorists to "cross crossings carefully" will always be necessary if we expect to reduce materially the number of frightful accidents at railroad crossings. Protective measures include increasing sight distances by removal of tall weeds, brush and other obstructions to a clear view and the banning of advertising signs near the crossing, as these tend to distract attention from the road ahead. The practice of placing "warning" signs by advertisers at unfrequently used spur tracks should be discouraged as tending to lessen the effect of standard crossing signs at intersections where their observance is essential to safety. In New York state all paved approaches to railroad crossings are being painted with black and white stripes extending across the pavement, the first at 230 feet from the intersection, the second at 125 feet and the motorist will be given a last chance to look for an approaching train by a zigzag stripe two feet wide 25 feet from the track. Illinois is experimenting with a similar method and stripes have been painted on the pavement at 35 grade crossings beginning at 400 feet from the crossing.

It is more than doubtful if a law designed to force motorists to come to a full stop before crossing a railroad track would ever prove effective and where its enforcement could be undertaken it would work a hardship on the traveling public and unnecessarily delay traffic. In one state where such a law is in effect it has served principally to provide a source of revenue for a few particularly zealous guardians of the public peace and happiness, and at one particular crossing has resulted in a number of motorists being victimized by footpads.

The exercise of reasonable care, the degree of caution being relevant to the conditions at particular crossings, is the most that should be asked of the users of the highway, the application of common sense to existing circumstances, rather than a burdensome paternalism on the part of governmental units.

Statistics furnished by the Interstate Commerce Commission show that some progress has been made in this respect particularly in view of the great increase in the number of automobiles in the past five years. In 1918 there were 1852 fatalities at grade crossings and 4683 people were injured, a total of 6535 killed and injured; in 1922 there were 1259 killed and 4493 injured, a total of 5752 killed and injured. The five years total shows that 31,242 people were either killed or injured in grade crossing accidents. The number who escaped being news items by a yard and helped to make the engineer prematurely gray must have been enormous.

The complaint frequently made that the great pains and expense on the part of the federal and state governments and the railroads involved in the construction of safe crossings is a burden imposed by only an occasional hopelessly careless motorist is not borne out by the above figures nor by a check of the traffic at grade crossings. An observation by the California highway department at a particularly dangerous crossing showed that a small percentage made any adequate effort to insure safety and that thirty per cent took the crossing at speed and looked in neither direction. The Santa Fe railroad has demonstrated in a number of tests that at least fifty per cent of automobile drivers do not look both ways before crossing the track. One check of 250 cars showed the following results: drivers of 98 cars looked neither to the right or left; 49 looked to the right only; 17 looked to the left only; 78 looked each way without stopping and one stopped and looked in both directions.

PAYING FOR THE ROADS WE'VE BUILT

The state auditor's office reports $78,699.48 as balance available from gasoline tax fund and $5,519.03 remaining from motor vehicle license fund, or $84,218.51 as the total balance on hand October 31, after paying interest and sinking fund charges accruing to date on state road bonds and costs incidental to the administration of the law. There remains to be paid this year $162,500 interest on bonds. The funds on hand are about half sufficient to meet this charge but the receipts for October due November 15, and those for November, when the state's fiscal year closes, should furnish enough revenue to pay these interest charges and provide some surplus.

The returns from the gasoline tax for September were $62,417.17 and while succeeding months will show some falling off, we will undoubtedly come out ahead but the hopes for a $300,000 state road maintenance fund will not be realized this year at least. The gasoline tax, it was estimated, would return a net revenue of $625,000, but the receipts since the law went into effect, March 8 to September 31, show a total of only $340,811.98. Belated collections may swell the total receipts for next year and with 1924 collections, beginning with December of this year, we will do better another season.

Receipts from the license tax to October 31 amounted to $426,092.08. The amount we have to pay out this year for road construction of former years is $675,000. This figure will apply for 1924 as well, but beginning with 1925 the annual interest and sinking fund charges will be $737,500, at which figure they will continue until 1937 when the $2,000,000 bond issue of 1917 will have been retired and the annual charges reduced to $547,500, beginning with 1938.

Status of Federal Aid Projects

UNDER CONSTRUCTION OCTOBER 31, 1923

No.	County	Name	Type	Length	Per Cent Complete	Contractor
4-F	Emery	Castle Dale-Ferron	Gravel	11.5	33	J. T. Raleigh Co.
5-ABC	Grand	Thompson-Moab	Graded Earth	37.79	99.5	J. J. Coan-Clark & Bush
6-ABC	Grand-San Juan	Moab-LaSal Junction	Graded Earth	23.25	94	Hyde & Black
9A	Millard	Delta-Holden	Gravel Surface	10.61	94	Johnson, Gillespie & Adamson
9-G	Millard	Holden-Kanosh	Gravel Surface	5.14	90	Johnson & Badger
9-H	Millard	do	Gravel Surface	5.75	90	Mathews, Barrus & Wrathall
9-J	Millard	do	Gravel Surface	7.80	90	Meadow Const. Co.
9-K	Millard	do	Gravel Surface	4.98	90	George & Bird
10-B	Uintah	Ft. Duchesne-Vernal	Gravel	5.2	28	A. G. Young & Co.
10-B	Uintah	Ft. Duchesne-Vernal	Bridges—Wooden	.....	8	Caldwell, Batty & Eaton
12-A	Washington	Ash Creek-Andersons Ranch	Gravel Surface	7.30	60	McArthur, Winsor & Whitehead
12-B	Washington	Ash Creek-Andersons Ranch	Bridges—Concrete	.....	93	Snow, Cannon & Kemp
17-A	Millard	Scipio-Juab	Gravel	7.08	8.3	Hawley, Anderson & Hinckley
17-C	Juab	Levan-Chicken Creek Dam	Gravel Surface	9.04	90	Paxton, Dorrity & Black
33	Cache	Sardine Canyon	Gravel Surface	6.96	57	Olof Nelson
39	Salt Lake	Magna-Tooele Co. Line	Concrete	6.41	74	Moran Paving Co.
41	Morgan	Morgan-Peterson	Gravel Surface	7.8	92	Western Engr. & Const. Co.
42-A	Wasatch	Heber-Hailstone	Gravel Surface	7.46	53	Gilkerson Const. Co.
42-B	Wasatch	Heber-Hailstone Bridge	Steel Truss	.....	99	Christensen, Jacob & Gardner
43	Sevier	Richfield South	Concrete	1.5	3	Gray & Murdock
44	Sevier	Salina City	Concrete	1.5	70	Gray & Murdock
45	Emery	Woodside Bridge	Steel Truss	.....	95	Security Bridge Co.
46	Rich	Woodruff-Wyoming	Gravel Surface	7.4	74	Kroft & Bundy
47-A	Sanpete	Moroni City	Concrete	1.0	95	Reynolds-Ely Const. Co.
47-B	Sanpete	Moroni-Fountain Green	Gravel Surface	7.09	60	Reynolds-Ely Const. Co.
47-C	Sanpete	Fountain Green	Concrete	1.0	....	Reynolds-Ely Const. Co.
47-D	Sanpete	Fountain Green-Juab Co. Line	Gravel Surface	5.33	16	Reynolds-Ely Const. Co.
49	Summit	Gogorza-Salt Lake Co. Line	Gravel Surface	3.06	40	Moss, Snarr & Thayne
51-A	Tooele	Wendover Salt Section	Gravel Surface	6.06	12	N. E. Lamas
52	Sevier	Salina-Redmond	Concrete	1.5	40	Gray & Murdock
53	Juab	Nephi City	Concrete	1.77	24	Wasatch Grading Co.

Projects for which Plans have been Submitted:

F. A. P. 17-B.

Chicken Creek-Millard Co. line; 13.87 miles gravel surface. This project extends from the south end of Federal Aid Project No. 17-C (now under construction) to the Millard county line and forms an important connecting link in the main state highway between Nephi and Fillmore. The original location survey followed approximately the present road, the total length by the old route being about 15 miles. Two major line changes have since been made that reduce this mileage by a little over a mile. The plans, specifications and estimate for this project have been submitted to the bureau of public roads.

F. A. P. 24-C.

Price City Underpass and Price City paving; 1.125 miles concrete. Bids were opened on this project on August 11 and the Utah Concrete and Stucco Co. of Salt Lake were the low bidders. The state road commission has been unable to let the contract covering this work until the bureau of public roads approves a right of way agreement between Carbon county and the Denver & Rio Grande railroad. A hearing was held on Sept. 26 before the public utilities commission to determine the amount of railroad participation in the cost of the Underpass structure. No decision has yet been handed down regarding this phase of the situation so that very likely no actual construction will be done on this project until early spring.

F. A. P. 31.

Riverdale Overhead Crossing in Weber County. The agreement with the Union Pacific R. R. was recently executed and the right of way obtained so that the state road commission finds itself in a position to advertise this work, and bids were opened November 13 for the 144-foot structure over the Weber river and the earth fill approaches, thus assuring that actual construction will commence on this important structure within a few weeks.

F. A. P. 50.

Payson-Juab County line; 8.56 miles concrete; Utah county. Plans and estimates for this important project were recently approved by the bureau of public roads. Actual construction will be delayed because the county has failed to obtain all of the right of way for the road, this being necessary on any federal aid project before the state road commission is allowed to advertise for bids.

F. A. P. 51-A.

Knolls-Wendover; 39.55 miles; gravel surface; Tooele county. Work was commenced upon the "Salt Section" of the above project on September 27. This section is about six miles in length. Bids were opened November 1 for the grading of the remainder of Section "A" and for the surfacing of the entire section. Kroft, Bundy, Zimmer & Lamus were low bidders on this work. No action has been taken upon the letting of this work as the state road commission is awaiting approval of the regional and Washington offices of the bureau of public roads.

F. A. P. 56.

Redmond-Sanpete Co. line; 2.13 miles gravel surface. This is an important road running north from the end of the concrete pavement now under construction in Redmond to the Sanpete county line. Plans were submitted to the bureau in September and have been tentatively approved. It is planned, however, to advertise this project together with F. A. P. 57, so the date of opening the bids will be controlled by the latter project.

F. A. P. 57.

Gunnison-Sevier Co. line, Sanpete county; 10.37 miles gravel and concrete pavement. Plans of this project were submitted in September; since then a minor line change has been found necessary near Axtell. The field work for this change has been completed and the plans and estimate will be revised and resubmitted in the near future so that this work can possibly be advertised this year.

Plans in Course of Preparation

F. A. P. 54.

Cedar-Kanarra; Iron county; 12.01 miles gravel surface. Plans and estimates of this project are 90% complete and will be sent to the bureau of public roads in the near future. It is hoped that this project will be advertised so that construction can be started this winter.

F. A. P. 55.

"Black Ridge" 4.3 miles gravel surface, Washington county. This project will consist of the grading and surfacing of what is known as the "Black Dugway" which is at present a steep and dangerous section of road. The alternate lines ran in the field are being investigated as to which is the best, taking into

account grade, alignment and economical construction. It is hoped that the plans and estimate can be completed soon and that this road can be constructed this winter at a time when traffic is at a minimum because it would be impossible to detour traffic in some places on this road.

F. A. P. 59.

Layton-Clearfield 4.11 miles; Davis county. This project will consist of the widening and resurfacing of a section of the old state standard 16-foot concrete road. Plans and estimates are 90% complete and call for the widening to 20 feet and the resurfacing with concrete or bituminous concrete. This is the first federal aid resurfacing work contemplated and for this reason the engineering department is investigating thoroughly the methods used by other states which have had considerable experience in this type of work.

Projects for Which Surveys Have Been Completed

F. A. P. 58.

Cache-Mantua; 4.14 miles gravel surface; Box Elder county. This proposed road will extend from the end of present Federal Aid Project No. 33, now under construction in Sardine canyon to Mantua. Plans and estimates will soon be completed and submitted to the bureau of public roads for approval. As it is possible to do some work in the heavy cuts on the work in the winter every effort will be made to hasten this project so this work can start.

F. A. P. 60.

Echo-Emery, 11.0 miles gravel; Summit county. The survey of this proposed road was recently completed but it was afterwards necessary to make a few minor changes in alignment in order to secure the approval of the railroad officials upon whose right of way the new road will encroach. Preliminary engineering work on this project will be rushed so that work can commence early next year.

F. A. P. 65.

Orem-Wasatch Co. line in Provo canyon; 9.5 miles gravel surface; Utah county. An inspection in the field of the two alternate lines upon which surveys were recently completed was made by Mr. E. E. Kidder, senior highway engineer of the bureau of public roads, and Mr. E. C. Knowlton, assistant engineer for the state. The purpose of this inspection being to determine the most feasible line. As soon as these engineers have made their report plans and estimates will be made of the proposed work and submitted to the government for their approval.

F. A. P. 66.

Parowan-Winn Hollow; 6.0 miles gravel surface; Iron county. The survey of this project was recently completed and a review made in the field by state and bureau representatives. Plans will be worked on this winter so that this road will be included in next year's road building program.

F. A. P. 67.

Scipio-Holden; 12.0 miles gravel surface; Millard county. The survey was recently completed on this proposed road project. It is an important link in the main north and south state highway and will connect up with Federal Aid Projects 17-A and 9-C. Plans and estimates will be completed this winter so that this project can be included in next year's program.

F. A. P. 72.

Devil's Gate-Weber; Davis county. The location survey of this project is about 90% complete and is under the direction of Mr. Joseph Tracy. The proposed line extends from the Devil's Gate wagon bridge to the Weber county line.

Proposed New Work

F. A. P. 68.

Dog Valley-Beaver; Millard county; 8 miles gravel. The location survey on this project has not started.

F. A. P. 69.

Wild Cat-Millard County line; Beaver county. This project extends from the north end of Wild Cat canyon, Federal Aid Project No. 26, to the Millard county line, connecting up with F. A. P. 68. It will be gravel surfaced and about 5 miles in length.

F. A. P. 70.

Nephi-Levan; Juab county; 9.5 miles. This is a proposed gravel surfaced project between Nephi and Levan, connecting the concrete surfaced project No. 53, now under construction in Nephi City, with the gravel surfaced Project No. 17 between Levan and Scipio.

F. A. P. 71.

Uintah River Bridge; Uintah county; 100-foot steel truss. This project will cover a structure over the Uintah river east of Fort Duchesne in the Ouray Indian reservation and will be a 100% federal aid participation in costs. The project statement was recently submitted to the bureau of public roads, approval of which has not yet been received.

F. A. P. 73.

Corinne-Tremonton; 15.0 miles; Box Elder county. The location survey for this project was recently authorized and this work will commence within the next week and will be under the direction of Mr. K. C. Wright, resident engineer on Federal Aid Project No. 33, now under construction in Sardine canyon.

ROAD IMPROVEMENT DURING OCTOBER

Funds paid out for labor and materials during October on projects under construction approached the quarter of a million mark. The total spent for construction and maintenance during the month is $237,249.85, the highest for the year. November will witness the closing down of practically all construction and as November 30th will mark the close of the state's fiscal year, a detailed account of the progress made during the year and the expenditure incurred by projects, will be given our readers in the next issue. The accounting department gives below a tabulation showing the funds on hand credited to each county and the corresponding expenditures during the past month:

Funds Available and Expenditures by Counties During October, 1923

	Available Maintenance	Expenditure Maintenance	Available Construction	Expenditure Construction
Beaver	$ 919.66	$ 260.39	$.....	$.....
Box Elder	8,047.71	58.27	21,835.58	15,992.61
Cache	.....	.....	28,923.43	7,599.45
Carbon	1,090.96	3.98	54,747.21	6.50
Davis	12.26	.....	3,330.29	89.88
Daggett	20.00	.17	.....	.....
Duchesne	309.88	55.21	.....	.....
Emery	1,099.30	1,025.17	29,248.32	10,444.29
Garfield	903.23	.....	.....	.....
Grand	4,739.06	84.27	21,676.20	6,162.36
Iron	2,552.66	1,450.67	15,427.95	4,330.64
Juab	545.10	297.46	94,599.18	30,400.61
Kane	6,713.62	555.64	.....	.....
Millard	2,248.03	227.10	50,921.36	3,186.90
Morgan	815.39	114.95	9,332.16	6,906.87
Piute	2,849.09	165.80	14,011.86	255.59
Rich	1,163.73	94.26	15,000.42	14,975.17
San Juan	2,774.69	460.84	25,166.07	3,695.37
Salt Lake	8,092.53	4,084.53	31,805.04	32,942.45
San Pete	475.12	25.07	38,253.55	21,720.50
Sevier	254.55	243.36	53,682.07	41,829.67
Summit	2,978.25	1,376.98	21,582.71	4,518.39
Tooele	848.88	636.26	18,726.37	315.94
Uintah	16.87	7.90	11,139.33	519.21
Utah	2,468.29	2,534.62	1,860.19	412.05
Wasatch	88.46	71.94	10,002.38	6,683.77
Washington	663.94	773.18	14,495.03	6,925.35
Wayne	945.17	247.50	.....	.....
Weber	5,527.15	2,496.47	5,838.08	84.29
	$59,163.55	$17,351.99	$591,604.80	$219,997.86

FOURTEEN YEARS OF STATE ROAD BUILDING

(Continued from Page 1)

Building 15 miles of concrete road, Nephi to Utah county line

tures in this state important. It is necessary in the interest of permanent location to make a selection that will offer the most favorable conditions of grade and curvature, freedom from snow blockades, elimination of stream and railroad crossings and where community development will permit, shorten distance.

Instances of accomplishment in this direction on the part of the engineering department might be multiplied indefinitely but for recent examples it may be mentioned that a relocation of a portion of the Zion Park highway in Juab county, F. A. P. 17-B, has shortened distance one mile in thirteen and while the Moroni-Fountain Green project, as before noted, follows the old road, the extension of the project from Fountain Green to the Juab county line, five miles, has been entirely relocated with a conspicuous improvement in snow conditions.

In 1916 the Federal Highway Act appropriated funds to aid the states in the construction of highways and in 1921 amended to create the national system to be composed of seven per cent of the nation's highway mileage. Utah's mileage of state roads in the federal system is 1684, more than half of the mileage in the state road system, and covers nearly all of the trunk line mileage in the state; and an additional 450 miles of state roads are subject to improvement with federal funds and under federal supervision as national forest roads. This leaves about 900 miles of state roads which cannot be improved except with 100% county funds as the state has now no general road building fund, and present construction contracts on the seven per cent system are paid by 26% county and 74% federal funds under state supervision.

Surveys, plans and estimates are under the direction of the state and are paid for with county funds, the federal bureau participating in construction costs only. Tables are given showing the federal allotments for Utah and the receipts to date from this fund which are payable upon certification of work performed.

Annual Federal Aid Allotment and Receipts

Year	Allotment	Receipts
1917	$ 56,950.15	$ None
1918	113,900.30	None
1919	738,355.27	44,451.84
1920	1,078,425.00	156,292.14
1921	1,129,575.66	784,780.42
1922	849,417.21	927,335.77
1923	566,278.14	918,455.09
	$4,532,901.73	$2,831,315.26

Payment has been received for nearly all the funds allotted from 1917 to 1921, inclusive, and the balance for these years is covered by projects under construction. Construction contracts also absorb $748,000 of 1922 funds. The estimated value of projects to be constructed includes all the federal aid allotted for this year, as well as for 1924, the federal allotment for 1924 is $735,827.37.

The following tabulation shows the expenditures by years for road improvement from 1909 to the close of the fiscal year 1922:

Year	Expenditures for Maintenance	Expenditures for Construction	Total Expenditures
1909-1912	Not segregated	$ 653,615.33	$ 653,615.33
1913-1914	Not segregated	839,358.86	839,358.86
1915	$ 40,555.81	381,839.55	422,395.36
1916	99,103.41	746,934.75	846,038.16
1917	114,211.44	618,135.59	732,347.03
1918	228,108.59	1,097,662.31	1,325,770.90
1919	504,003.00	2,543,563.65	3,047,566.65
1920	426,364.41	3,313,887.80	3,740,252.21
1921	212,253.02	2,389,612.58	2 ,601,865.60
1922	193,376.03	2,181,815.66	2,375,191.69
Totals	$1,817,975.71	$14,766,426.08	$16,584,401.79

Spanish Fork Canyon Highway Is Important

The highway through Spanish Fork canyon is one of the very important east and west Utah routes, for both local and through traffic. Considerable work has been done by the Utah county road department during the past year in maintenance, and some portions of the road have been reconstructed. Before proceeding further in their program for betterments the county officials wisely concluded that it would be better to arrange with the state road commission for a final location to be made through the canyon, so that the proper location can be followed when any work is hereafter done by the county forces, pending the time that agreements are entered into with the Bureau of public roads for the reconstruction of this highway.

From Soldier Summit westerly to Detour the present location will not be amended but from Detour on for a distance of twenty five miles radical changes will have to be made in order to eliminate railroad grade crossings, and better conditions as to alignment, grades and width of roadway. A party is now in the field engaged in this work of location the reconnoissance having been made immediately after the county officials requested that action be taken. It has been determined that the five grade crossings of the double track main line of the Denver & Rio Grande Western can be eliminated as well as the crossings at grade of the six yard tracks and Marysville branch track at Thistle station.

The revised location contemplates three overhead crossings, the two as now existing, one at the mouth of the canyon and one at Gilluly, with an additional overhead crossing at Detour station.

Improvements Made in Grand Canyon Highway

A location party has been organized and instructions given the engineer in charge, Mr. S. C. Risley, to proceed to Junction, Piute county, on November 9th, to relocate the highway through Circle valley. It is the expectation that this section will be constructed in 1924 thus completing a first class highway that will extend from Marysville southerly to a point in Circleville canyon seven miles south of the town of Circleville.

On this project several line revisions will be necessary, and the existing road will be greatly improved and shortened.

Work is in progress also at Fountain Green, Moroni, Gunnison, Salina and Richfield in consequence of which the Grand canyon highway will be greatly improved by the summer of 1924.

James, have you whispered today without permission?"

"Only wunst."

"Leroy, should James have said wunst?"

"No'm, he should have said twict."—Winnipeg Tribune.

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INDEPENDENT GASOLINE I-GO OIL

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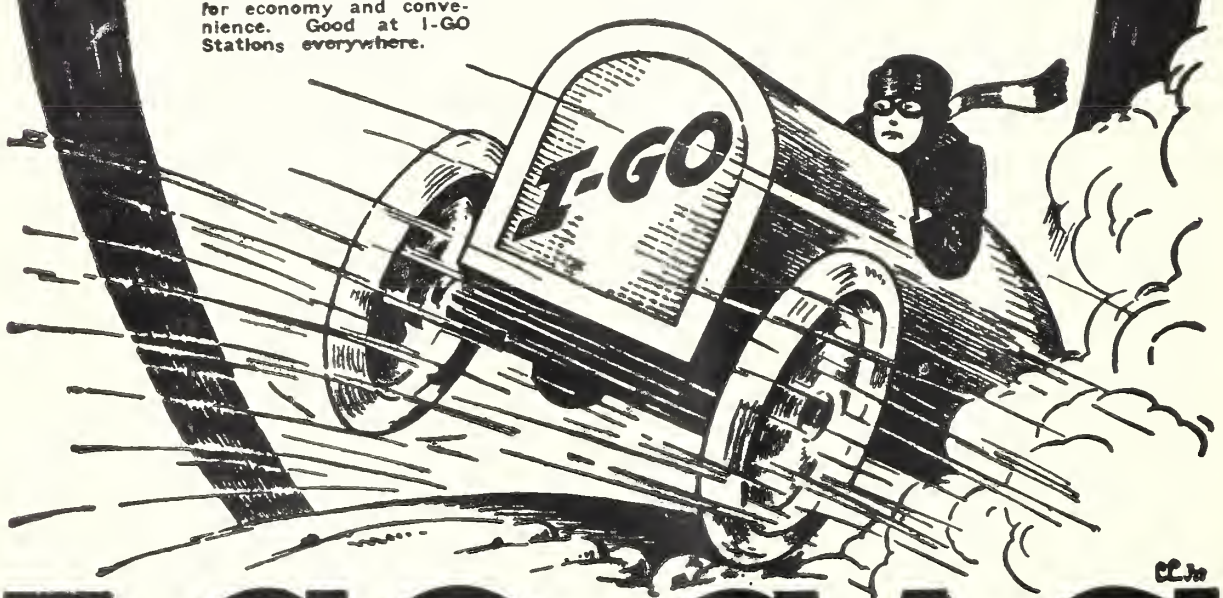

I-GO GAS

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Urge Reciprocity of Automobile Licenses

Uniform reciprocity of automobile licenses among the states was advocated in the recent address in Washington, D. C., of M. O. Eldredge, executive chairman of the American Automobile association, in which he called attention to the fact that there are only sixteen states which permit motorists from other states to use their roads freely for the full period granted by the visitor's state up to the remainder of the licensed period. The reciprocal period in the remaining states is from 10 to 90 days.

"The forty-eight states of the Union and the District of Columbia now have general statutes regulating the use and operation of motor vehicles. No two of these statutes are exactly alike. In fact, their points of difference are much more numerous than their points of similarity. These various laws are not even sufficiently similar to enable the motor vehicle user engaged in interstate travel to make a good guess as to the regulations to which he may subject himself by crossing the imaginary line which separates geographically one state from the other.

"Not one of the owners of the 13,000,000 motor vehicles in the United States will disagree with the proposition that uniformity in motor vehicle regulation is not only expedient but highly desirable and yet there is a strong inclination on the part of each state to insist that uniformity should be attained by making the laws of the other states accord with its own.

"It was the fundamental conception of our forefathers who laid the foundation of our government, who drafted the constitution and who saw the dangers which might arise from dual sovereignty existing within a single country, that everywhere and at all times and by all means, intercourse among the various states of the Union should be kept absolutely free and unobstructed. Freedom of traffic and travel among the states is increasingly essential as our population grows, our business transactions multiply and our radius of travel increases.

"And yet it is a fact that upon the introduction of every new form of intercommunication, the same struggle must be had for the recognition of its rights under the principles already referred to. It was so with steam vessels, it was so with the stage coach and the railroad and it was so with the bicycle and it is so now with the automobile.

"Now that congress has adopted the policy of aiding the states to the extent of paying 50% of the cost of a system of state and interstate roads comprising 7 per cent of the total mileage in each state and that over half a billion dollars has already been provided by congress for this purpose, it would seem that the time has come when congress should go a step farther and provide for the free use of highways across these imaginary state lines.

"There are now sixteen states which permit motorists from other states to use their roads freely for an entire year or fraction thereof, or for the period granted by the visitors' state. These states are: Alabama, Delaware, Florida, Idaho, Kentucky, Louisiana, Maine, Michigan, New York, Ohio, Oregon, Pennsylvania, South Dakota, Virginia, Washington, Wisconsin.

"If a motorist from any one of the sixteen states desires to travel in one or more of those states, he can do so throughout the year without having to purchase additional tags, but if he desires to motor in New Jersey, Connecticut, Rhode Island or any of the thirty-two states which have limited reciprocity, he must take out an additional tag in those states after the reciprocal period has expired, which varies from 10 to 90 days or more.

"There is complete reciprocity between the District of Columbia and all other states except Maryland, but all motorists visiting the nation's capital are required by police ordinance to register at the police station within three days. What senators and congressmen will do to this police ordinance when they return to Washington and are called upon to register at police headquarters can be imagined.

"The Constitution of the United States provides that congress shall have power to regulate commerce with foreign nations and among the several states. Mr. Justice Marshall, first chief justice of the United States, once handed down the decision that commerce with foreign countries and among the state, strictly considered, consists of intercourse and traffic but it has since been pointed out by the supreme court that in the absence of a law by congress, states may require motorists from other states to pay taxes on their automobiles for the purpose of constructing and maintaining roads which they help to destroy.

"The inference of the highest court that there should be a national law covering the subject should prompt our immediate attention to the matter for it is certainly a most unusual situation when a citizen of the United States is not free to travel in any section of the country after he has provided himself with identification number from his own state and has complied with its laws."

Castle Gate-Duchesne Road Snow Fighters

Most of us recall the picture of the husky St. Benard rescuing an exhausted wayfarer from cold and death in the snow bound passes of the Alps, and remember the story of how the monks in the mountain Hospice of St. Bernard trained these faithful animals to seek out and lead to safety the imperiled traveler.

This service, with a modern setting, will be duplicated during the coming winter on the divide between Castle Gate and Duchesne. The "monks" will be experienced tractioneers employed by Duchesne county to keep the road open for automobile traffic and the dogs will be replaced by two powerful caterpillar tractors and a team.

A cabin near the summit, elevation 9000 feet, will house the men and here they will stay all winter, keep the road free from snow blockades and offer such assistance as may be needed. A barn will be arranged to house the caterpillars and it will be heated so that the machinery will be warmed up and ready to go at all times with the added advantage that there will be much less liability of breakage of parts in attempting to operate during the periods of extreme cold weather.

Last winter the postal service with trucks and caterpillars succeeded in getting the mail through regularly to the towns in the Uintah Basin but it has proved too expensive to continue and the public was frequently obliged to take the eastern and longer route by way of Wellington and Myton.

Carbon county will keep the road open on its side, from Price to the summit, and it has been arranged to divide the expense so that the state will meet half of the total cost and Duchesne and Carbon counties half.

Miscellaneous Road Notes

San Juan County.

State Road Agent Heber Frost is in charge of the construction of the road from Bluff to the oil fields in San Juan county, for the building of which the last legislature appropriated $15,000. Most of the road has been completed and according to reports from Bluff twenty-five men were at work the last of October on the portion known as the Butler Wash dugway. This work and the surfacing of about one mile of the road with shale will complete the job and the $6000 which remains from the appropriation will prove sufficient to furnish a good road from Bluff to San Juan's new industry with the exception of a steep grade in rock on Navajo hill which cannot be reduced without the expenditure of many more thousands of dollars.

Juab County.

The state road maintenance forces in this county have undertaken, with the cooperation of county road officials an extensive campaign of improvement of the Eureka-Silver City highway, designated as a state road by the last legislature. The improvements include widening, some grade and curve reduction and surfacing with gravel. Fifteen or twenty teams and a large force of men are at work on the job and its early completion is expected.

Gibbons & Read, contractors on the paving in Eureka City, were on the "home stretch" at the close of October. The paving of the business district and the sidewalk extensions which were a part of the contract, is a noteworthy improvement and a further display of the progressive spirit of this substantial mining community.

Utah County.

A delegation from Utah and Juab counties, including members of the county commission of both counties and citizens from the towns of Eureka and Dividend, appeared before the road commission October 30 to urge the rerouting of the new Santaquin-Silver City state road to include the town of Dividend, which desires a state road connection between it and Eureka, the market town for the Tintic mining district. Assistant Chief Engineer H. S. Kerr will go over the proposed route and determine whether or not a further survey will be advisable.

The county commissioners have appro-

priated $2000 to initiate the construction of a road up Hobble Creek canyon which possibly may be increased by federal funds as part of a forest development program. Millions of feet of aspen and pine would be tapped by this road. The development of a marble quarry in the canyon would be made practicable by the construction of the road and the distance from the Strawberry to Springville would be shortened by approximately twelve miles.

Summit County.

PARK CITY, Oct. 17.—Work on the new road between Park City and Coalville, decided upon by the county commissioners and the city council of this city, was begun Monday and will be pushed to completion before winter sets in.

The road will be built across the flat from the Union Pacific roundhouse to Beggs's mill on Silver creek, and will eliminate several steep grades and bad turns and will avoid passing through the trash dumping grounds of the city.

Davis County.

Two and one-quarter miles of paved county road has been widened from nine to a nineteen-foot slab and connected with the paved state highway at its intersection with Gentile street in Layton. The cost of the work is $25,000, divided as follows: Davis county, $12,000; Town of Layton, $5,000; Layton Sugar company, $12,000.

Salt Lake County.

The paving of the last four miles of the Salt Lake-Bingham, awarded to the Moran Paving Co., will not be started until spring, due to the lateness of the season and other circumstances which render beginning at this time inadvisable.

Duchesne County.

An appropriation of $1,300 by the county and an equal amount furnished by the communities benefited, will be expended on the Roosevelt-Neola and the Cedarview-Monarch road. Repairs are badly needed, as each morning and evening the trucks carrying the high school pupils must travel these roads and at times they are almost impassable.

Carbon County.

The Carbon county commissioners and citizens of Price are proceeding with the improvement of the Price to Myton highway and a large force of men and twenty teams are at work on the Soldier canyon section and intend to develop a good winter road into this section of the Uintah basin.

Improved Road Mileage In San Juan County

One of the early Utah Federal Aid projects contemplated was No. 3, from Thompson in Grand county, via. Moab the county seat, to Monticello, the county seat of San Juan county. The original project has since been cut to three projects, No. 5 from Thompson to Moab, No. 6 from Moab to La Sal Junction and No. 7 from La Sal Junction to Monticello. Project No. 5 has been completed and No. 6 is nearing completion. No construction work has to date been undertaken on No. 7 on occount of the limited resources of San Juan county. A plan is now being worked out by the State commission whereby the first section of project 7 six miles southerly from La Sal Junction can be constructed, and the required survey work is now being made. For this six miles an entirely new location has been decided upon, and this section, as did various portions of projects 5 and 6 presents interesting engineering problems and entails some expensive construction.

From Thompson to La Sal Junction the present highway is a great contrast to the old road, and is very satisfactory indeed to the residents of Grand and San Juan counties. It is the hope of the residents of that section of the state that upon completion of the first section of projects No. 7 that arrangements can be made whereby the county's portion of construction costs can be raised for the completion of the highway to Monticello and later on to Blanding and from Monticello easterly to the Colorado line, thus completing the Utah portion of the "Navajo Trail."

MOTORIZING THE LANGUAGE

A little girl from the city had been visiting in the country, and was being questioned as to what kind of a time she had. Finally someone said, "I bet you don't even know how to milk a cow."

"Bet I do," she said.

She was pressed for particulars, and explained: "You take the cow into the barn and give her some breakfast food and water and then you drain her crankcase."—Prairie Farmer.

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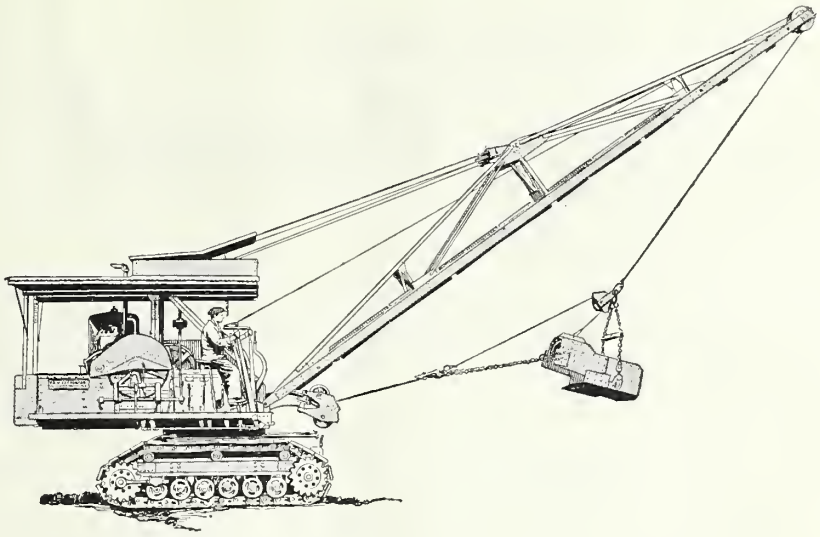

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12. Heavy cast steel center pin with adjustment for wear. Full floating vertical propelling shaft.
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14. Combined swing gear and roller track is an extra heavy steel casting with external cut teeth. Provided with spokes to keep center pin exactly in center.
15. Machine is mounted on heavy all steel non-cloggable corduroys. Two speeds.
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17. Steering performed from operator's seat regardless of position of the turn table.
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The Burden---

[377,460 tons]

and the Proof

"To learn the facts" Illinois built an experimental road. Over a two-mile course, 63 different sections were laid. Three principal materials and every possible thickness and combination were employed.

Then fleets of motor trucks were sent over the surface. For many days and nights the loads pounded across that two-mile stretch. At intervals the weight was increased until finally each rear wheel of every truck was bearing 8,000 pounds. A total of 377,460 tons were carried over the road during the test.

At its completion only thirteen of the original 63 sections had survived. **Ten were of portland cement concrete.**

The other three had heavy foundations of the same class of concrete, that had been used without additional wearing surfaces in the first ten.

But many other sections built with the same "wearing surfaces," placed on less enduring foundations, were failures. An adequate thickness of good concrete, therefore, was the winning factor.

The test, equivalent to several years of normal highway traffic, proved that portland cement concrete assures the necessary strength and rigidity to meet the gruelling punishment of modern road demands.

Properly built concrete pavement is the most enduring and economical road construction material known. It does not need the added cost of "wearing surfaces" or "tops" of other material. It combines all of the essentials of the ideal road. It is economical, skid-proof, rigid and lowest in maintenance cost.

Illinois performed a distinct service for the taxpayers of the nation when it built the Bates Experimental Road. The lesson it taught should guide voters in every state in the Union when they face the need for better highways.

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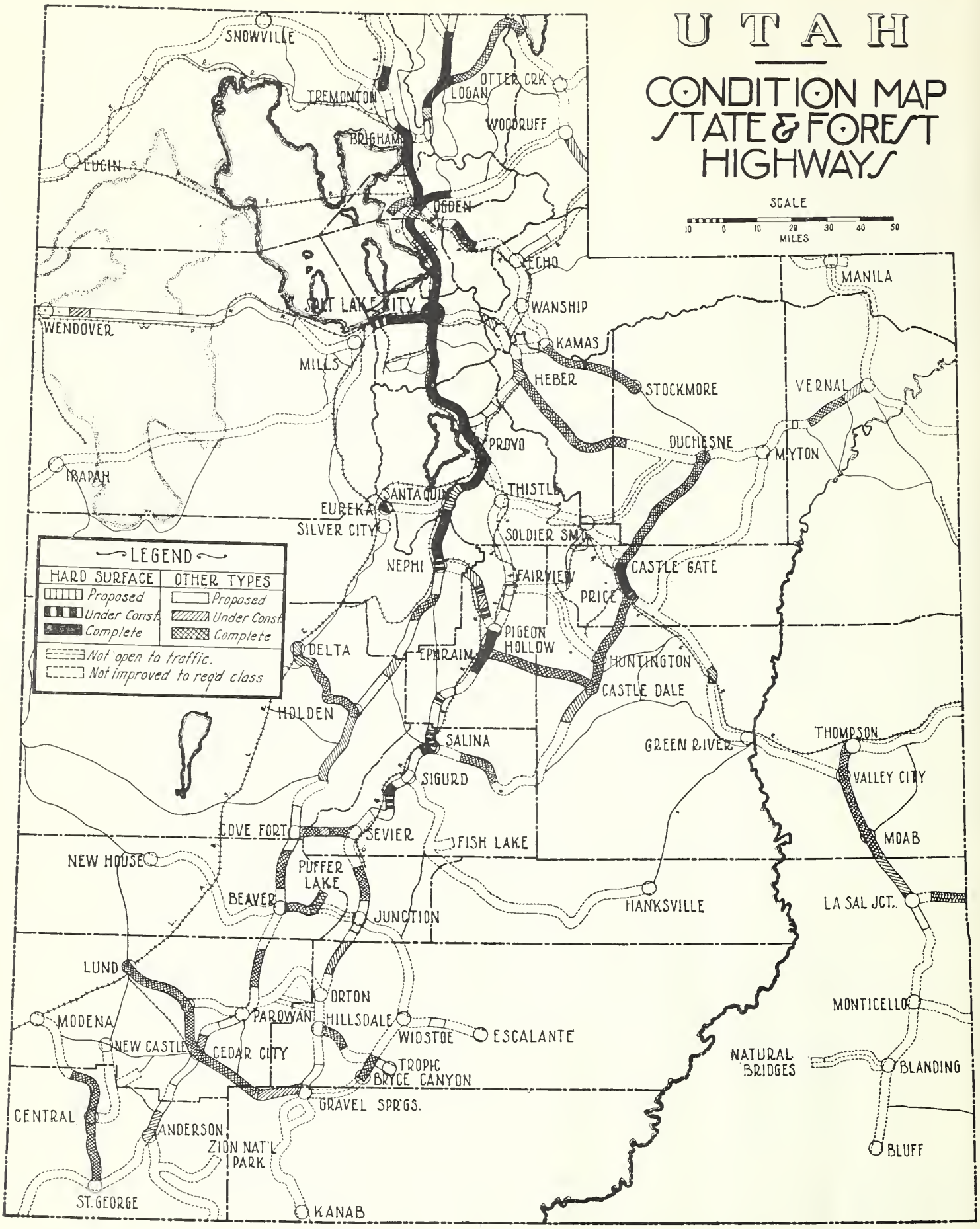
Utah Highways

Vol. 1 December, 1923 No. 5


UTAH
CONDITION MAP
STATE & FOREST
HIGHWAYS
SCALE
10 0 10 20 30 40 50
MILES
LEGEND
HARD SURFACE
Proposed
Under Const.
Complete
OTHER TYPES
Proposed
Under Const.
Complete
Not open to traffic.
Not improved to reqd class
SNOWVILLE
TREMONTON
OTTER CRK.
LOGAN
WOODRUFF
BRIGHAM
LUGIN
OGDEN
ECHO
MANILA
SALT LAKE CITY
WANSHIP
WENDOVER
KAMAS
MILLS
HEBER
STOCKMORE
VERNAL
PROVO
DUCHESNE
MYTON
IBAPAH
SANTAQUIN
THISTLE
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MONTICELLO
MODENA
PAROWAN
HILLSDALE
WIDSTOE
ESCALANTE
NEW CASTLE
CEDAR CITY
TROPIC
NATURAL BRIDGES
BLANDING
BRYCE CANYON
GRAVEL SPR'GS.
CENTRAL
ANDERSON
ZION NAT'L PARK
BLUFF
ST. GEORGE
KANAB

Utah Highways

VOLUME 1. DECEMBER, 1923. NUMBER 5.

More Than 100 Miles of State Road Improved in 1923

During the fiscal year Nov. 30, 1922, to Nov. 30, 1923, forty projects were under construction. Of these twenty-one projects were covered by contracts let prior to Nov. 30, 1922, and a total of 102.76 miles of unfinished road were carried over to this year. Nineteen projects totalling 63.18 miles of road were added to the list under construction during the year, six of these, however, not until August or later; but altogether 102.56 miles were completed during the year, 63.38 miles being carried over to 1924. The mileage completed includes 8.1 miles graded earth, 80.58 miles gravel surface and 13.88 miles of concrete pavement.

Expenditures for engineering and construction on the above work, including twelve bridges, completed during the year, totals $1,481,311.62. Expenditures for work performed prior to November 30, 1922, were $166,457.85, the total for preliminary engineering on projects in 1924 program is $24,839.71 and $310,985.86 has been expended for maintenance, a total during the year for construction, maintenance and engineering of $1,983,595.04.

Modification of Concrete and Gravel Types of Surfacing

The past year has been noteworthy for the improvement in design of both concrete and gravel roads. The increase in traffic both in weight and in volume and the large sums that have been and which are yet to be invested in paving and other types of surfacing have led to a close study in this and other states of the behavior of the types under traffic and our standard cross sections have been redesigned as a result. The most extensive investigations were made on pavement in Illinois in 1922 where two miles of experimental road consisting of 22 sections of brick, 17 of asphalt and 24 of concrete were subjected to a series of tests by driving a fleet of trucks over the sections at measured speed and with loads gradually increased until a gross load of nearly ten tons for each truck was reached. A number of types were tested to destruction under this traffic, while 41.6 per cent of the sections consisting of concrete or concrete base successfully sustained all loads.

The type of concrete pavement most commonly constructed on our state roads heretofore has been 6 to 8 inch plain concrete, 6 inches thick at the edges and crowned to 8 inches at the center over a flat subgrade. Largely as a result of the above tests this section has been changed to a type similar to that which has been developed in California and Arizona and sometimes called the Maricopa section. In this the thickest concrete instead of being at the center is at the edges which are further strengthened by a ¾-inch steel reinforcing bar running continuously the length of the pavement.

Temperature stresses, it has been ascertained, cause the pavement to warp or "curl," the heat of the sun expanding the upper portion of the pavement during the day and tending to lift the center from the subgrade. The reverse of this at night causes the pavement to lift at the edges, the surface of the pavement being colder and contracting more than the lower part. Experiments have shown that the breaking or cracking of the pavement near the edges and particularly near the transverse expansion joints occurs most frequently at night. To reduce the effect of temperature chances as much as possible a continuous longitudinal joint is placed along the center of the pavement completely dividing it into two 9-foot strips.

The form of the joint, which is of steel, is such that the paved strips are notched together to prevent vertical displacement and to further strengthen the joint transverse reinforcing bars four feet long connect the strips every five feet. Transverse joints are placed at approximately 200-foot intervals or at the completion of each half-day's work of placing concrete.

All of the paving contracts let this year have been on this type and consist of 6-inch slab thickened to 9 inches on the edges. Most of the paving carried over from last year was on a heavier section, a 7-inch slab on the Magna-Tooele pavement and 7½-inch Brigham to Corinne, and on the latter a longitudinal center joint was placed for the last 4000 feet.

Gravel Surfacing

The prevailing type of gravel surfacing placed during the year is six inches thick throughout, a departure from the former type of 8 inches on center line and thinning in 9 feet to 2 inches at the edges, on a flat subgrade. In the new type the earth shoulders are in place on either side before the gravel is placed and compacted. The gravel is spread and rolled in two courses and successive changes in the specifications have reduced the maximum sizes of crushed stone or gravel allowed until 100% must now pass a 1½-inch screen for the base course and no material larger than one inch is permitted in the top or wearing course. To secure the required percentages of binder and intermediate sizes the gravel specifications now provide that the contractor must furnish a plant containing revolving screens having a total length of from 12 to 16 feet and divided into three parts to effect the required grading and the wasting of oversize and excess binder. The use of this method of screening will usually require elevation of the material by means of bucket elevators or inclined belt conveyors.

Construction

A tabulation listing all the projects under construction during the year in numerical order and showing types, cost, completed mileage and per cent complete is given in this issue. A brief description of the construction with federal aid listed by counties follows:

Beaver County: On the Beaver-Millard road, Project 26, the grading and gravel surfacing of 9.55 miles, through Wildcat canyon, was completed. This project is largely a relocation of the original road and easier grades and a pleasing alignment has been obtained through rather difficult country. The roadway conforms to the standard width of 24 feet, the gravel surfacing is 18 feet wide, and eight inches in thickness on center line.

Box Elder County: The Brigham-Corinne paving contract awarded in October, 1922, 4 miles, was completed in September. This is the heaviest type of concrete laid on a state road to date, the heavy trucking in the vicinity of the sugar factory having made it advisable to construct a 7½-inch pavement. It is an extension of the paved road to Salt Lake City and south which with the completion of projects now under contract, the Riverdale Overhead in Weber county and the paving extension south of

Payson will provide an uninterrupted paved strip for a distance of 150 miles.

Cache County: A relocation of the route over the summit between Wellsville and Brigham has been under contract during the year. Beginning at the Box Elder-Cache county line at the summit and at the intersection with the old road the new route follows the north side of Sardine canyon with a good exposure which will lessen the difficulties of winter travel and with much improvement secured in grade and alignment, over the old route through Wellsville canyon.

Carbon County: The Helper bridge, a 75-foot steel truss, was completed in May and with the paving of the approaches all of the concrete pavement between Price and Castle Gate has been completed and opened to traffic.

F. A. P. 24-C. Price City Underpass and Price City paving; 1.125 miles concrete. Bids were opened on this project on August 11 and the Utah Concrete & Stucco Co. of Salt Lake were the low bidders. The state road commission has been unable to let the contract covering this work until the bureau of public roads approves a right of way agreement between Carbon county and the Denver & Rio Grande railroad. A hearing was held on Sept. 26 before the public utilities commission to determine the amount of railroad participation in the cost of the Underpass structure. No decision has yet been handed down regarding this phase of the situation so that very likely no actual construction will be done on this project until early spring.

Emery County: Contract was let July 25 covering the grading and gravel surfacing of 11.5 miles from Castle Dale to Ferron, Project 4-F, and the construction of the Rochester Flat bridge, which will complete Project 4-H. This is a three- span I-Beam structure with concrete deck. These projects are being constructed under agreement covering the appropriation of federal funds for the construction of post roads. The road is not a part of the seven percent system and no further federal aid funds can be had for its improvement.

On the Price-Green River road, Federal Aid Project 45, covering the construction of a 100-foot steel truss span on rubble masonry abutments across the Price river at Woodside, was awarded to the Security Bridge company April 23 and completed about November 15. The contract included the construction of 0.25 mile of graded approaches with gravel surfacing.

Grand County: Among the projects completed during the year is Federal Aid Project 5, 37.99 miles graded earth and part gravel surfaced, Thompson to Moab. This project has been under construction since 1919 when contracts were awarded on three sections for a twelve-foot roadway, which was later changed to 24 feet to conform to bureau standards. The greatly increased cost resulting has given four successive state road commissions some problems to solve in the way of highway administration and finance and a procession of resident engineers has wrestled with the problems of location in this extremely difficult region. The depletion of the state's construction fund and the inability of Grand county to handle the increased costs due to the change of type resulted in construction being closed down over much of the time and the history of this project affords a valuable but expensive object lesson in the desirability of definitely settling all questions of finance, location and type of structures before a contractor is directed to assemble his forces and commence construction. Although the roadway has at last been completed and accepted we still have Project 5 with us, two bridges were washed out in the unusually heavy floods of last summer and the project will be reopened for their reconstruction with federal aid.

Iron County: One bridge and one road contract were completed in this county during the year, the bridge a 75-foot steel span on cement rubble masonry abutments across Coal creek north of Cedar City and the road the gravel surfacing of the Buckhorn Flat section of the Parowan-Beaver road. Plans have been submitted to the bureau covering the construction of 12 miles of gravel surfaced road from Cedar City to Kanarra and it is planned to advertise and start construction of the project this winter.

Juab County: The pavement from Nephi north to the Utah county line and the gravel surfacing finished this year or included in the 1924 program will complete the construction of the Zion Park highway across Juab county.

The project completed this year is 17-C, nine miles of grading and gravel surfacing from Levan to Chicken Creek; 17-B, to be awarded in December, is an extension south to the Millard county line, about 14 miles, and Project 70, construction to start subsequent to July 1, provides for the gravel surfacing of the remainder of the unimproved portion between Nephi and Levan.

Millard County: Project 9-ABC, 30 miles, Delta to Holden. Contractor has been released on sections B and C covering about 20 miles of the project and these sections are complete with the exception of a small amount of surfacing to be applied by the county before acceptance. Section A, 10.6 miles, is 95% complete. Much difficulty has been experienced in obtaining gravel suitable for surfacing and a large part of Section A has been surfaced with Eureka mine waste. This is another project constructed with post road funds, the Delta-Holden road being off the present federal aid system.

No. 9-GHJK. These sections cover 23.67 miles of gravel surfacing, Holden to Kanosh, the satisfactory scarifying and recompacting of the gravel surfacing is about all that remains to be done on these contracts. A contract was awarded

Magna-Tooele Concrete Highway

August 21, for the construction of 17-A, beginning at a point two miles southwest of Scipio and extending to the Juab county line. These projects with the Scipio-Holden connection scheduled for construction next year, will complete the improvement of all but about 20 miles of the state road in Millard county.

Morgan County: Contract was awarded November, 1922, for the construction of Project 41, Morgan to Peterson, 7.8 miles gravel surfacing and the project has been completed.

Piute County: Project 19-A, extending from Marysvale to the north city limits of Junction 12.56 has been recently completed and accepted. The original plans contemplated the hard surfacing of the first 4.5 miles south of Marysvale, but gravel surfacing was later decided upon and as completed 5.72 miles of the project are gravel surfaced. The adjacent natural material used for this purpose has proved very satisfactory, averaging better, perhaps, than anywhere else in the state for a like mileage.

Rich County: Construction began on the Woodruff-Wyoming Project No. 46, July 7. The project includes some heavy grading and the surfacing of 7.4 miles of road, Kroft & Bundy, contractors. Work was suspended for the season on October 27 on which date the project was 74% complete.

Salt Lake County: Construction began on Salt Lake county's only federal aid highway, the Magna-Tooele county road, Dec. 4, 1922, but not much progress could be made until spring. Most of the grading is finished and 4.25 miles of paving have been constructed and opened to traffic; 2.15 miles remaining to be built next season.

San Juan County: Project 6-ABC, 23 miles long, Moab to LaSal Junction, is a continuation of Project 5 on the Thompson-Monticello road, 7.4 miles of Section A being located in Grand county. Construction on this project began in the same year as Project 5 and completion of the project has been delayed from the same causes. The greater part of the grading has been finished for nearly two years, and all of the structures are now built with the exception of a culvert at Little Mule Shoe and four miles of gravel and shale surfacing which is now being applied on some sandy stretches. The road from Thompson to Monticello and from Monticello to the Colorado state line has been added to the seven per cent system.

Sanpete County: Project 47 includes two miles of concrete pavement and 12.5 miles of gravel surfacing. The paving, sections A and C, consisting of a mile each in Moroni and Fountain Green, the gravel sections B and D including the road between the two towns and from Fountain Green to the Juab county line. The Reynolds-Ely Const. Co. have the contract for the construction of all sections.

A study of snow conditions during the winter of 1922-23 led to the relocation of Section D, the new location offering, it is believed, a much better route than the old for all-year traffic. This section is now 30% complete. The paving on the first section is open to traffic, none has been laid in Fountain Green and the gravel surfacing between the two towns is 75% complete. The connection from Thistle to Pigeon Hollow Junction has recently been made a part of the federal aid system.

Sand Pitch Bridge—Proposed Gunnison-Sevier Project

Sevier County: Contract covering the construction of six miles of concrete pavement in three projects, is under construction, Gray & Murdock, contractors. They include 1.5 miles south of Richfield; 1.5 miles in Salina City and 3 miles Salina-Redmond, Projects 43, 44 and 52, respectively. A total of 2.7 miles has been built, the pavement in Salina being completed.

Summit County: Construction during the year in this county has consisted of the grading preparatory to the gravel surfacing of 3 miles from the summit at the Salt Lake county line to Gogorza. The project No. 49 is 40% complete.

Tooele County: Project 51-A will include the grading and gravel surfacing of 39.55 miles across the Great Salt Lake desert from Wendover on the Nevada state line to Knolls. Construction was begun September 27 on 6 miles of what is known as the "Salt Section," N. E. Lamus is the contractor. No award has been made as yet for the construction of the remainder of the subgrade and the gravel surfacing. The work under construction is unique for the reason that an overlying salt burden of from three to four feet thick must first be removed in a series of borrow trenches in order to get at the clay which is used in constructing the embankment and also that the excavations are now being made under water. Several months during the year the salt beds are covered with about a foot of water which necessitates a two-foot embankment across the section with a six to one slope on the north side which will be overlaid with gravel beaching to protect the road from the wave action, the wind and waves having an unimpeded sweep of many miles on the north, while on the south at about 100 feet distant a railroad embankment parallels the project and affords protection in that direction.

When dry the salt beds offer an unsurpassed speedway for automobile traffic.

Uintah County: A. G. Young & Co. have the contract for the construction of five miles of gravel surface road west of Vernal, Project 10-B and a portion of 10-C. The remainder of 10-C consists of the paving of 0.7 miles with native rock asphalt in Vernal, which is to be constructed on state force account. Project 10-B also includes the erection of four timber bridges, Caldwell, Batty & Eaton, contractors.

Utah County: The completion this year of the Spanish Fork-Payson pavement, 6-inch concrete on a crowned subgrade, affords a continuous paved strip in Utah county from the Salt Lake county line to Payson, and Project 50, 8.5 miles, contract for which has been awarded since the close of the fiscal year, will complete the pavement to the south limits of the county.

Wasatch County: Near the close of the previous year contracts were let for the construction of 7.46 miles of gravel surface road between Heber and Hailstone and the construction of a 63-foot steel truss on reinforced concrete abutments at the Provo river crossing, Federal Aid Project 42-A and B. The bridge is completed and four miles of gravel surfacing have been placed at the close of the construction season.

Washington County: The improvement of a bad stretch of road between Ash creek and Anderson's ranch has been under way during the past season as Project 12-A; 7.3 miles gravel surface. Construction has been made difficult on account of the rough nature of the ground and the large boulders encountered in excavation. The project is 60% complete. 12-B includes four concrete bridges on the above improved route, one 35-ft, two 40-ft., and one 45-ft. span. These bridges have been completed.

Weber County: Contracts were awarded November 22 for the construction of the Riverdale viaduct, which will provide a crossing of the Weber river and the Union Pacific tracks south of Ogden. James J. Burke & Co. have the contract for the construction of the 144-ft. steel truss over the Weber river, the railroad is to construct a 126-ft. steel truss over its right of way; the Union Construction Co. has the contract for the construction of the graded earth approaches and the earth fill included between the structures. This contract also includes the gravel surfacing which will be placed on the fills preliminary to the construction of a concrete pavement.

Federal Aid Projects Under Construction in 1923

F.A.P. No.	County	Location	Type	Length	Comp. prior 1923	Comp. during 1923	Per Cent Comp.	Contractor	Est. Cost	Expended 1923
4-F	Emery	Castle Dale-Ferron	Gravel	11.17	.....	4.5	53	J. T. Raleigh Co.	$121,841.35	$ 42,168.77
5-ABC	Grand	Thompson-Moab	Graded Earth	37.79	37.54	0.25	100	J. J. Coan	333,489.66	69,089.13
5-ABC	Grand	Thompson-Moab	Gravel	12.50	10.00	2.50	100	J. J. Coan		
6-ABC	Grand and San Juan	Moab-La Sal	Graded Earth	23.25	23.00	0.25	100	Hyde & Black	372,423.13	Grand Co. 10,851.35
6-ABC	Grand and San Juan	Moab-La Sal	Gravel	6.77	.....	2.6	39	Hyde & Black		+21,108.06 San Juan Co.
9-A	Millard	Delta-Holden	Gravel	10.61	3.50	6.6	95	Johnson, Gillispie & Adamson	103,676.90	86,677.35
9-G	Millard	Holden-Kanosh	Gravel	5.14	1.75	3.13	95	Johnson & Badger	29,146.30	16.579.99
9-H	Millard	Holden-Kanosh	Gravel	5.75	1.28	4.18	95	Mathews, Barrus & Wrathall	30,478.61	19,129.24
9-J	Millard	Holden-Kanosh	Gravel	7.80	1.80	5.60	95	Meadow Const. Co.	46,919.33	33,631.78
9-K	Millard	Holden-Kanosh	Gravel	4.98	1.67	3.06	95	George & Bird	25,487.81	18,984.42
10-B	Uintah	Fort Duchesne-Vernal	Gravel	3.186	.....	.....	22	A. G. Young & Co.	31,166.96	7,169.76
10-BC	Uintah	4 Bridges	Wooden	55 ft.	.....	.....	20	Caldwell, Batty & Eaton	15,201.26	See above
10-C	Uintah	Vernal	Native Asphalt	0.70	.....	.....	.....	State Forces	15,303.20	
10-C	Uintah	Fort Duchesne-Vernal	Gravel	1.31	.....	.....	14	A. G. Young & Co.	18,380.45	16.94
12-A	Washington	Ash Creek-Anderson's Ranch	Gravel	7.30	.....	2.0	60	McArthur, Winsor & Whitehead	87,070.67	50,480.57
12-B	Washington	Ash Creek-Anderson's Ranch	4 Bridges	160 ft.	.....	4 Bridges	100	Snow, Cannon & Kemp	65,337.71	44,175.88
15	Iron	Parowan-Beaver	Gravel	9.5	2.5	7.0	100	Adams, Mack Const. Co.	78,391.89	45,139.16
17-A	Millard	Scipio-Juab	Gravel	7.1	.....	0.8	28	Hawley, Anderson & Hinckley	48,288.16	17,168.65
17-C	Juab	Levan-Chicken Creek	Gravel	9.04	2.20	6.84	100	Paxton, Dorrity & Black	73,627.34	52,893.34
19-A	Piute	Marysvale-Junction	Graded Earth	12.6	5.0	7.6	100	A. G. Young & Co.	79,458.21	39,878.75
19-A	Piute	Marysvale-Junction	Gravel	5.72	.....	5.72	100	A. G. Young & Co.		
24-B	Carbon	Helper Bridge	75 Ft. Steel Truss	.....	.....	1 Bridge	100	Security Bridge Co.	67,971.13	24,597.17
26	Beaver	Beaver-Millard	Gravel	9.55	9.05	0.5	100	Ross & Bean	.....	15,687.71
30-B	Weber	Ogden-Huntsville	Concrete Bridge	43 ft.	1 Br.	1 Br.	100	Kroft & Bundy	44,331.33	25,389.96
31	Weber	Riverdale Viaduct	Steel & Gravel Surf.	0.5	.....	.....	5	J. J. Burke & Union Const. Co.	157,000.00	3,748.73
33	Cache	Sardine Canyon	Gravel	6.96	.....	3.7	67	Olof Nelson	120,852.89	63,460.25
34-B	Utah	Spanish Fork-Payson	Concrete	5.74	4.62	1.12	100	Phelps Const. Co.	228,529.69	39,827.20
38-A	Box Elder	Brigham-Corinne	Concrete	4.0	.....	4.0	100	Gibbons & Read	113,239.73	125,313.21
39	Salt Lake	Magna-Tooele County Line	Concrete	6.41	.....	4.26	77	Moran Paving Co.	210,674.70	144,054.09
41	Morgan	Morgan-Peterson	Gravel	7.80	.....	7.80	100	Western Engr. & Const. Co.	70,455.88	56,618.23
42-A	Wasatch	Heber-Hailstone	Gravel	7.46	.....	4.00	54	Gilkerson Const. Co.	68,904.85	33,888.53
42-B	Wasatch	Heber-Hailstone	Steel Bridge	.....	.....	1 Bridge	100	Christensen, Jacob & Gardner	21,682.61	20,098.38
43	Sevier	Richfield-Elsinore	Concrete	1.5	.....	.....	7	Gray & Murdock	68,654.20	5,515.08
44	Sevier	Salina City	Concrete	1.5	.....	1.5	100	Gray & Murdock	49,630.10	34,604.17
45	Emery	Woodside Bridge	Steel and Gravel	0.25	.....	0.25	100	Security Bridge Co.	32,301.01	36,322.02
46	Rich	Woodruff-Wyoming	Gravel	7.40	.....	3.61	74	Kroft & Bundy	56,218.58	39,155.56
47-A	San Pete	Moroni City	Concrete	1.00	.....	1.00	97	Reynolds-Ely	39,237.73	32,497.96
47-B	San Pete	Moroni-Fountain Green	Gravel	7.09	.....	6.00	75	Reynolds-Ely	53,298.19	25,841.35
47-C	San Pete	Fountain Green	Concrete	1.00	.....	.....	.....	Reynolds-Ely	32,774.95	2,525.23
47-D	San Pete	Fountain Green-Juab Co.	Gravel	5.42	.....	.....	30	Reynolds-Ely	45,064.48	7,459.03
48	Iron	Coal Creek Br.	Steel & Gravel Surf.	0.19	.....	0.19	100	Kroft & Bundy	30,978.36	31,765.09
49	Summit	Gorgola-Salt Lake Co.	Gravel	3.06	.....	.....	40	Moss, Snarr & Thayne	40,448.27	19,446.09
51-A	Tooele	Knolls-Wendover Salt Section	Subgrade	6.0	.....	.....	22	N. E. Lamas	.....	12,386.00
52	Sevier	Salina-Redmond	Concrete	3.0	.....	1.2	40	Gray & Murdock	96,288.13	36,915.44
53	Juab	Nephi City	Concrete	1.8	.....	0.8	65	Wasatch Grading	36,070.43	17,080.95

Appropriations for 1924 Construction to Exceed $2,750,000

Twenty-seven new federal aid projects are included in the 1924 construction program as now outlined by the commission at an estimated cost which will place under project agreements the federal allotments for Utah including that for the fiscal year 1925, which will be made available July 1, 1924. The total cost of these projects will be $2,752,600, of which $2,021,800 represents the amount which will be paid by the federal bureau and is within a few thousand dollars of all the federal aid funds which are or will become available for the next construction season.

Since the close of the state's fiscal year a contract has been awarded for the construction of one of the projects in the 1924 program, the paving of the 8.5 miles which will connect the present pavement ending at Payson with the strip extending from the Utah county line to Nephi. This contract absorbs $193,483 of the two million dollars of federal funds not included in contracts for construction at the end of November. Tenders have been received for three other projects but no contract awarded at the time of writing this article. They are: Wendover to Knolls, except the grading of the six miles across the salt beds, which is now under construction; Price City paving and under pass; and the 14-mile extension of the gravel surfacing in Juab county to the Millard county line. These three will further reduce the federal aid available by $524,800.

Of the twenty-three projects remaining for consideration, plans and specifications have been submitted to the bureau for four, covering 23.4 miles of gravel surfacing and 1.11 miles of paving. These will include gravel surfacing from Cedar City to Kanarra, 12.1 miles; Redmond to the Sanpete county line, 2.1 miles, with extension of 9.2 miles from the county line to Gunnison and paving in Gunnison. The other project is the further improvement of the Brigham-Wellsville road and will include some heavy grading and surfacing with gravel of 4.1 miles from the summit crossing to Mantua in Box Elder county. The federal liability on these four projects is estimated at $279,300. With the first projects described these total $997,500 of the federal allotment, which means that $1,024,300 remains to be apportioned to other projects, and, further, an analysis of the federal aid annual apportionment shows that but $178,200 remains after the above deductions, of the 1923 and 1924 allotments, which are the only federal funds that will be available for construction before July.

It was the intention of the commission to have all of the above projects under construction during the 1923 season but due to settlements of rights of way, adjustments with railroad and municipal corporations and other reasons they have been carried over to the 1924 program. The Wendover project in particular, it was expected, would be further advanced by this time but only six of the forty miles are under construction.

The attitude of the federal government in regard to this project is expressed in the following telegram from Thomas H. MacDonald, chief of the bureau of public roads, received during the session of the last legislature:

> "The uncompleted section of the highway across the Salt Lake desert presents the most conspicuous condition now pending before the bureau of roads in the matter of providing connections of important transstate highways. The providing of this connection is held to be so important that it will be necessary for the bureau in recommending projects to respect that portion of the federal highway act requiring preference to be given those projects which will expedite the completion of an adequate system of interstate highways. The bureau is withholding recommendation upon the location of the road west of Salt Lake City on account of the uncertainty of the state being willing to finance its portion of the cost. The bureau estimates that the state should have available for this purpose immediately about one hundred thousand dollars."

The failure of the legislature to make an appropriation at all consistent with this recommendation has greatly delayed progress on this important project essential as it is to the continuation of construction with federal aid in the state. In this connection we may note that federal allotment for Utah, 1917 to 1925, inclusive, totals $6,117,729. Vouchers for work performed covering more than half of this sum have been submitted to the bureau for payment and $2,931,280 has been approved and paid to November 30. A large proportion of this represents 74% of the construction costs on projects that are of both local and interstate importance constructed in several instances at great expense, but it should be remembered that the federal highway act contemplates, as the primary reason for this assistance, the completion of a system of national highways and as stated by Mr. MacDonald the bureau regards the Wendover road as the most necessary improvement under consideration in the development of that system.

It is considered desirable to divide the $178,200 of federal funds remaining in the 1923 and 1924 allotments between the construction of the underpass and eleven miles of gravel surface road in Echo canyon and the construction of the 100-ft. steel bridge over the Uintah river on the Duchesne-Vernal road and which due to its location in the Ouray Indian reservation, will be 100% federal aid.

From the 1925 funds of $849,000, construction to start subsequent to July 1, seventeen projects are included in the program as follows: The rebuilding of two bridges in Grand county, destroyed by floods last summer, and the following gravel surface projects: In San Juan county, 6 miles south from La Sal Junction; in Piute county, Junction to Red Bridge, 4.5 miles; a twenty-five mile extension of the Wendover-Knolls project in Tooele county; the "Black Ridge" project in Washington county, four miles; Salina to Richfield in three projects, eighteen miles; Weber canyon in Davis county, four miles; Brigham-Corinne extension, six miles, with the Bear river bridge, a 200-ft. steel truss, a separate project; Provo canyon, four miles; Parowan-Winn Hollow in Iron county, 9.4 miles; and Mt. Pleasant-Spring City, 9.4 miles; Scipio Holden, 12 miles; Nephi-Levan, 9 miles; and Mt. Pleasant-Spring City, six miles. The only hard surface project contemplated from the 1925 funds is the Layton-Clearfield resurfacing, 4.11

Brigham-Corinne Concrete Pavement. F. A. P. 38-A—4 Miles

miles, the completed pavement to be twenty feet wide.

Due to the absorption in the above projects of all the federal aid available before July 1, 1925, the commission cannot see its way clear at the present time to place under contract next season a number of projects which have been under consideration. It is possible that some changes may be made in the program now outlined. An additional mileage may be placed under construction by a change in the present practice of requesting 74% federal aid on all projects regardless of the county in which they are located by reducing the ratio in some counties, the proportion to be determined on the basis of a comparison of assessed valuation, consideration being given also to the mileage and population within each county. Some such plan appears to be both workable and equitable, and at any rate it is not likely that the maximum federal aid, or about $22,000 a mile, will be requested in the future on any hard surface projects. Where the population along a state road is sufficiently great to justify paving, the county, or community so served, should be willing to bear a proportionately greater share of the cost and release federal funds to aid in increasing the state mileage of standard gravel roads.

The following tabulation shows the location, type, length and estimated costs of projects in the 1924 program:

F.A.P. No.	County	Location	Type	Length	Ttl. Cost	Fed. Aid
5–D	Grand	Bridges		.....	$ 46,000	$ 34,000
7–A	San Juan	La Sal Junction—South	Gravel	6.0	36,500	27,000
17–B	Juab	Chicken Creek-Millard Co.	Gravel	13.87	135,300	100,100
19–B	Piute	Junction-Red Bridge	Gravel	4.5	27,000	20,000
24–C	Carbon	Price City	Concrete	1.12	118,200	37,600
50	Utah	Payson-Juab Co.	Concrete	8.51	261,400	193,400
51–A	Tooele	Wendover-Knolls	Gravel	39.55	523,000	387,000
51–B	Tooele	Knolls-Mathews	Gravel	25.0	135,200	100,000
54	Iron	Cedar-Kanarra	Gravel	12.1	122,800	90,900
55	Washington	Black Ridge	Gravel	4.0	121,600	90,000
56	Sevier	Redmond-Sanpete Co.	Gravel	2.1	14,500	10,700
57	Sanpete	Gunnison-Sevier	Concrete	1.11	145,500	107,700
58	Box Elder	Cache-Mantua	Gravel	4.14	94,600	70,000
59	Davis	Layton-Clearfield	Concrete	4.11	113,500	84,000
60–A	Summit	Echo-Emery	Gravel	11.0	150,000	135,000
61–A	Sevier	Salina-Aurora	Gravel	4.0	32,400	24,000
61–B	Sevier	Aurora-Sigurd	Gravel	7.5	54,000	40,000
61–C	Sevier	Sigurd-Richfield	Gravel	6.5	48,600	36,000
62–A	Davis	Devils Gate-Weber	Gravel	4.0	74,400	55,000
63–A	Box Elder	Brigham Corinne Extension	Gravel	6.0	48,600	36,000
63–B	Box Elder	Bear River Bridge		.....	54,000	40,000
65–A	Utah	Provo Canyon	Gravel	4.0	60,800	45,000
66–A	Iron	Parowan-Winn Hollow	Gravel	9.4	74,400	55,000
67	Millard	Scipio-Holden	Gravel	12.0	94,600	70,000
70	Juab	Nephi-Levan	Gravel	9.0	75,700	56,000
71	Uintah	Uintah River Bridge		.....	41,400	41,400
72–B	Sanpete	Mt. Pleasant-Spring City	Gravel	6.0	48,600	36,000
				214.71	$2,752,600	$2,021,800

Center Joint in Place Prior to Pouring Concrete, Nephi City Pavement—F. A. P. 53

Henry H. Blood Again on Road Commission

Governor Charles R. Mabey Friday reappointed Henry H. Blood of Davis county to the state road commission. Commissioner Blood was appointed to fill out the term of Ira R. Browning, who resigned and whose term would expire on December 1. Mr. Blood is the Democratic member of the commission, the law providing that two members shall be of the dominant party and one of the minority in the state.

Construction of the Magna-Tooele Road

BY F. S. THOMPSON, Chief Draftsman

The past season has witnessed the construction of an important link in the state's main east and west highway, the Magna-Tooele road. It is true that the road has not been completed as far as the Tooele county line, but nevertheless it is now open to traffic to a point one mile past Garfield townsite and is serving the hundreds of employes of the Utah Copper company and other companies, who daily go from and return to Salt Lake; and also accommodates the local traffic between the various towns on this route.

Work actually commenced on this road about one year ago, but very little was accomplished until early in the spring of the year, when actual grading operations were started. Many complex and interesting problems entered into this construction. The location of the new road was limited to a great extent to that of the old road because of the extensive holdings of the copper company and the B. & G. railroad in the vicinity of Magna and Arthur. However, every opportunity was taken for any possible reduction of maximum grades and elimination of sharp curves. Beyond Arthur the new road takes a new location and eliminates many steep grades and other undesirable features of the old road.

Actual paving operations started July 25, 1923, and continued until about Nov. 3, fair progress having been made considering the fact that a large part of this paving was laid on 4% to 6% grades and considerable care had to be taken on the many curves which were superelevated and widened. Concrete aggregates were hauled by rail to various sidings near the road where they were dumped in stock piles and then loaded into batch boxes and hauled by truck to the mixer. The road throughout is an 18-foot concrete surface with a uniform slab of seven inches thick with a one-inch crown.

Finishing was carried on by the use of a mechanical tamper and finishing machine. Joints of elastic joint filler were placed at noon and night to a thickness equivalent to a ⅜-inch joint every forty feet. Shoulders four feet wide of natural material were built upon both sides of the pavement.

The completed portion presents as smooth a riding piece of concrete road as can be found anywhere in the state and furnishes a long needed all-the-year road to the important smelting towns of Magna, Arthur and Garfield.

Native Rock-Asphalt to Be Used In Road Building

By J. B. JENSON, E. M.

Bituminous or asphalt sand-rock is found quite largely in Utah and is among the highest grade rock-asphalt to be found anywhere. Asphalt rock such as is used in paving generally consists of limestone saturated with petroleum residue, which is almost free from solid paraffin. The grains forming asphalt-rock are almost invariably totally uncemented except by the bituminous matter, and the rocks fall to powder when the bitumin is removed by a solvent, although when retorting is the method used the fixed carbon which is left in retorting serves as a binder to maintain the original structure of the rock. Owing to the fact that our asphalt rock contains large percentage of limestone, they form a most excellent natural road-making material.

Among the important deposits in Utah may be mentioned that which occurs in limestone in the right hand branch of Tie Fork, a canyon running northeast of the town of Clear Creek. This deposit contains between six and fifteen per cent of asphalt with at times as high as seventy-five per cent and scarcely any fixed carbon. In Utah county we have a large area underlaid with asphaltic limestone which occurs just north of Colton and south of Strawberry creek, extending from Antelope creek on the east to Thistle on the west. In Grand county at the head of West Water canyon, about twenty miles north of the town of West Water, we have a very rich deposit containing 50 per cent of asphalt and 50 per cent of limestone. In Uintah county the largest deposit occurs southeast of Vernal, north of the White river between Ashley and Uintah valleys, in a vein from three to as much as forty feet wide, which contains approximately 11½ per cent of asphalt. A series of deposits occur in Argyle creek, a tributary of the Minnie Maud creek, which in turn flows into the Green river, about twenty miles south of Ouray. It contains between eight and ten per cent of asphalt. In Utah county we have a strong deposit about one and one-half miles north of Thistle, containing twelve per cent of asphalt. This property has been partially opened up and operated on a small scale.

Extensive Asphalt-Rock Beds

In Carbon county we have one of the most extensive asphalt-rock deposits in the state, located thirty-four miles southeast of Price and approximately six miles east of Sunnyside, the latter town being one of our most important coal camps and the leading one in the production of smelter coke. This deposit of asphalt forms a cap to the Patmos ridge, several hundred feet in thickness and extends from a point about three miles northeast of Sunnyside, showing an exposure fully seventeen miles long and extends to a point ten miles northwesterly from Sunnyside through township 13 S., range 13 E.; township 14 S. range 14 E., S. B. M.

This outcrop faces west and the east portion of this mountain consists of a solid body of asphalt showing an average grade of 10 per cent to 11 per cent bituminous matter at the openings. Portions of the outcrop show bituminous matter as high as 20 per cent. Patmos ridge is a thousand feet high, has a gentle slope of 30 degrees showing asphalt exposure the entire distance. The area known to contain asphalt approximates at least four thousand acres.

The average weight of the asphalt is 110 pounds to the cubic foot and assuming the thickness to be 50 feet over this 4000 acres, this tract actually contains more than five billion tons of first class paving materials. It is doubtful if there is another large single tract in existence in which the material is in sight and in a position for extraction by simple methods of quarrying. It is evident that this body of asphalt is inexhaustible, at least for many generations to come.

Mining at the rate of one thousand tons per day, this rock will lay daily twelve thousand square yards of surface two inches thick, or a stretch of highway one mile long and twenty feet wide. The tonnage embraced in these four thousand acres, it is estimated, would build a road one thousand feet wide around the world and yet leave enough to pave every street, avenue, alley and driveway in Salt Lake, or a road one and one-half miles wide from San Francisco to New York. With the coming area of road building to accommodate the thousands of automobiles necessary to conduct our every day transportation requirements it is evident that these deposits of asphalt offer one of the greatest assets that the state of Utah can possess and should be at present under active extraction and used for paving material by either private or public directors, for Utah roads are far behind those of our western states and it will require years to bring them up to the standard which will be required by our citizens.

Petrol Possibilities from Asphalt-Rock

About three years ago a shipment of this material was made to the Jenson Reduction plant in Salt Lake City for the purpose of determining the possibilities of commercial production of petroleum from it. It was found that this rock yields readily to distillation and produces an average of twenty-two gallons of high grade petroleum of which 17 per cent is paraffin and 83 per cent asphalt, and which produces on fractionation ten gallons of lubricating oil, twelve gallons gasoline, thirty-four pounds paraffin and one pound ammonium sulphate with an average value ranging between eight and ten dollars. The cost of mining, retorting, refining, etc., will not exceed four dollars per ton, and it is evident that in addition to the use of paving material for the entire state's system of highways this deposit alone has the ability, if properly worked, to furnish also sufficient gasoline and lubricating oils for all the automobiles in the state for years to come.

For paving purposes it is necessary only to crush and heat the material until it becomes sufficiently plastic to spread upon the roadway and does not require the measurement and mixture of different grades of sand and gravel with the asphalt that is necessary in the preparation of other road-making asphalt, coming as it does already prepared and saving a very considerable expense in its preparation. It is spread, rolled and treated otherwise in exactly the same manner as the artificially mixed products of a similar nature. We thus have in these great deposits, two of our greatest essentials for the state's growth, gasoline and good road material.

Utah Asphalt-Rock Has Been Tested for Paving

Asphalt-rock has been given severe tests both on Salt Lake streets and many eastern towns and has proven to be one of our best paving materials. Most of the sidewalks in the town of Vernal, Utah, also have been paved with asphalt taken from the quarry previously mentioned and which is located in the Uintah Basin, not far from Vernal. This deposit was at one time supposed to be in the Wasatch formation, but later investigation shows it to be in the Uintah formation, a much later formation than the Wasatch.

The asphalt does not originate in the Uintah formation, however, but has migrated into it, presumably from some of the shales in the Green river formation, which have been retorted and from which oil has been produced by nature at some time during the earth's history, and then carried by capilarity into the asphalt-rock above. While this asphalt is a residuum of petroleum, it nevertheless cannot justly be considered an indication that oil can be obtained by drilling at this place.

The sidewalks of Vernal have now been used for many years and although no special preparation of asphalt was made when laid, other than to crush, heat and spread it out, these sidewalks compare today very favorably with the best asphalt sidewalks in any other of our cities.

Considerable quantities of asphalt-rock were shipped a few years ago, also from the deposit located at the head of Tie creek some miles northwest from Soldier Summit, a considerable portion of which was used for street paving in Salt Lake and the remainder shipped to eastern cities for paving purposes. In all cases it has shown splendid lasting quality and lower first cost than the prepared product.

Construction of Zion Park Loop Sure

Cedar-Long Valley Road, a Portion of Proposed Utah Scenic Highway Loop

Approval has recently been granted by the secretary of agriculture for the inclusion in the federal aid system of a proposed connection between the Zion Park and Grand Canyon highways. The route will include the location of about 25 miles of highway over the summit east of Zion Park where there is no existing road and which will necessitate, according to the reconnaissance survey, the construction of a tunnel 1000 feet long or more. This addition to the federal aid highway system totals 69.1 miles and will lead from Anderson's ranch, it increases Utah's federal aid mileage to 1588 and 96 miles remain to be designated to bring the total up to the maximum allowance of 1684 miles.

Not only will this connection shorten the distance now traveled in visiting the three scenic wonders in southern Utah by 130 miles, but will also provide a much needed connection between Kanab and the railroad at Cedar City. The distance by the new route from Kanab to Cedar City will be 100 miles and the summit crossing at an elevation of 6500 feet, will furnish a practicable winter route to a region now cut off by winter snows four months out of the year from its present railroad point at Marysvale, 175 miles to the north.

The new loop will take, roughly, the farm of a square, with the west side beginning at Cedar City and running south 40 miles through Anderson's and Tequerville at Verkin, which latter will be, in the preposed relocation of the Zion Park or Arrowhead Trail route in this vicinity the point of departure from the north and south through highway of the south side of the loop which leads to and through the park. From Springdale, at the border of the park, the road will continue east 25 miles' to ajunction with the Grand canyon highway near Mt. Carmel and from there north to Gravel Springs junction to Bryce canyon and west over the Cedar Vong valley road to Cedar Breaks near Cedar City, completing this scenic drive which will offer the traveller bound north or south on either main highway between Salt Lake and the Arizona line the opportunity of visiting without long retracements this scenic group.

The new road from Zion Park to Mt. Carmel will take the visitor through one of the most magnificant canyons to be found in Utah in a region new visited by only an occassional trapper or hunter, and wholly inaccessible to any sort of vehicle. The northerly portion of the loop, Gravel Springs to Cedar City is new under construction as a forest project and is nearly completed. This is through a heavily wooded region of mountains and unland with mountain springs and streams abounding and affording inviting sports for camping and recreation.

Neither the federal or state funds which will be required to build the connection, which will cost, constructed to federal standards $1,000,000, are available at present but the secretary's approval of the new route assures its construction as soon as the necessary appropriations can be made.

Summary of State Road Maintenance for 1923

By JOHN R. STEWART, Maintenance Engineer

A very fair showing in the maintenance of the state roads has been made during the past year notwithstanding the limitations which in several counties have operated to reduce the effectiveness of the maintenance program. The unusually heavy floods in July and August have in many places required an unlooked-for expenditure of time and labor and seriously depleted the county funds available for maintenance. In some instances less than the usual appropriations for maintenance have been made in anticipation of assistance from the state with funds which it was thought would be available from the gas tax receipts, an unduly optimistic view when it is recalled that the provisions of the law require that the sinking fund and interest on road bonds must be met before any funds from this source are turned over to the road commission for maintenance purposes. Indications now are that after the prior claims of past construction expenses have been met that about $100,000 will be all the funds available for current expenditures at the beginning of the next season and $675,000 must again be set aside from the receipts from the motor vehicle and gas tax in 1924 before any additional maintenance funds can be had. In other words, all or nearly all the assistance that can be given the counties in any one year will be derived from the surplus from the motor vehicle and the gas excise tax for the preceding year.

The maintenance department has been diligent in its endeavors to see the patrol system of maintenance in every county and on all the state roads and some gratifying results have been obtained, but in some instances it is not clear that the county commissioners have been converted to the ultimate economy, among its other benefits, of this system. However, in the counties where it has been tried out this year it has, I believe, met with general favor and it is planned to continue and extend the system over a greater mileage. The experience of our department has led us to consider this method of maintenance the only one suitable to present traffic requirements and to the proper conservation of the many millions of dollars invested in highway construction.

In 1922 the patrol system was installed, in part, in nine counties. During the past year these counties have continued to use and enlarge its application, with one exception, and five other counties have been added to the list. The one exception is Washington where the patrol sections were so long, due to shortage of funds, that the patrols have been discontinued for the present. In the following counties all the state road mileage is under patrols: Salt Lake, Rich, Juab, Piute. In the following counties the system has been adopted in part: Weber, Summit, Millard, Iron, Carbon, Uintah, Sanpete, Cache and Utah.

Unit costs for maintenance of hard surfaced roads are less this year than in 1922, due partly to the reason that more effective methods have been worked out and also due to the fact that the maintenance was better in 1922 than in 1921. Cost data for 1923 have not been brought down to date and where available will be made the subject of another and more detailed statement.

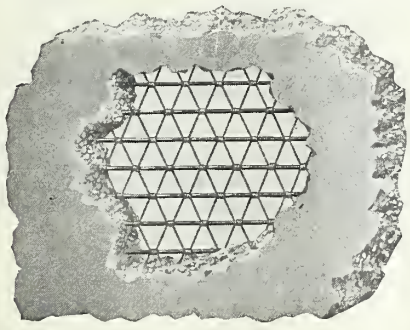
Winter maintenance is becoming more important each season, due to the steady increase of winter traffic. On a number of canyon roads and summit crossings patrols will be kept busy all winter keeping the road clear of snow. During the past summer the department has built snow fences at many points where heavy drifts accumulated on the road last winter, altogether about ten miles of snow protection fences have been built.

The maintenance program for 1924 and the plans for the distribution of the state funds have not been fully worked out. In this connection it may be stated that the federal authorities hold the state responsible for the proper maintenance of the roads that have been improved with federal aid and it may prove advisable to distribute the funds derived from the gas tax in such a manner as to increase the standard of maintenance on these roads.

Reinforcement of Concrete Roads Pays Dividends

Reduced Maintenance Expense

Records of several states that have carefully checked maintenance costs of reinforced concrete and non-reinforced concrete pavements prove this beyond a doubt.



Utah's experience coincides with other states as to the benefit of properly reinforcing concrete roads. Note the condition of three miles of concrete road between American Fork and Pleasant Grove; one of the oldest and best pieces of concrete road in the State. Reinforced with Triangle Mesh Fabric Throughout,—(Laid in 1918). The only maintenance cost data available shows an expenditure of $10.50 for 1923, for the three miles.

As the years go by, evidence of the economy of reinforced concrete roads multiply.

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Buy from an Independent dealer. Look for the I-GO sign.

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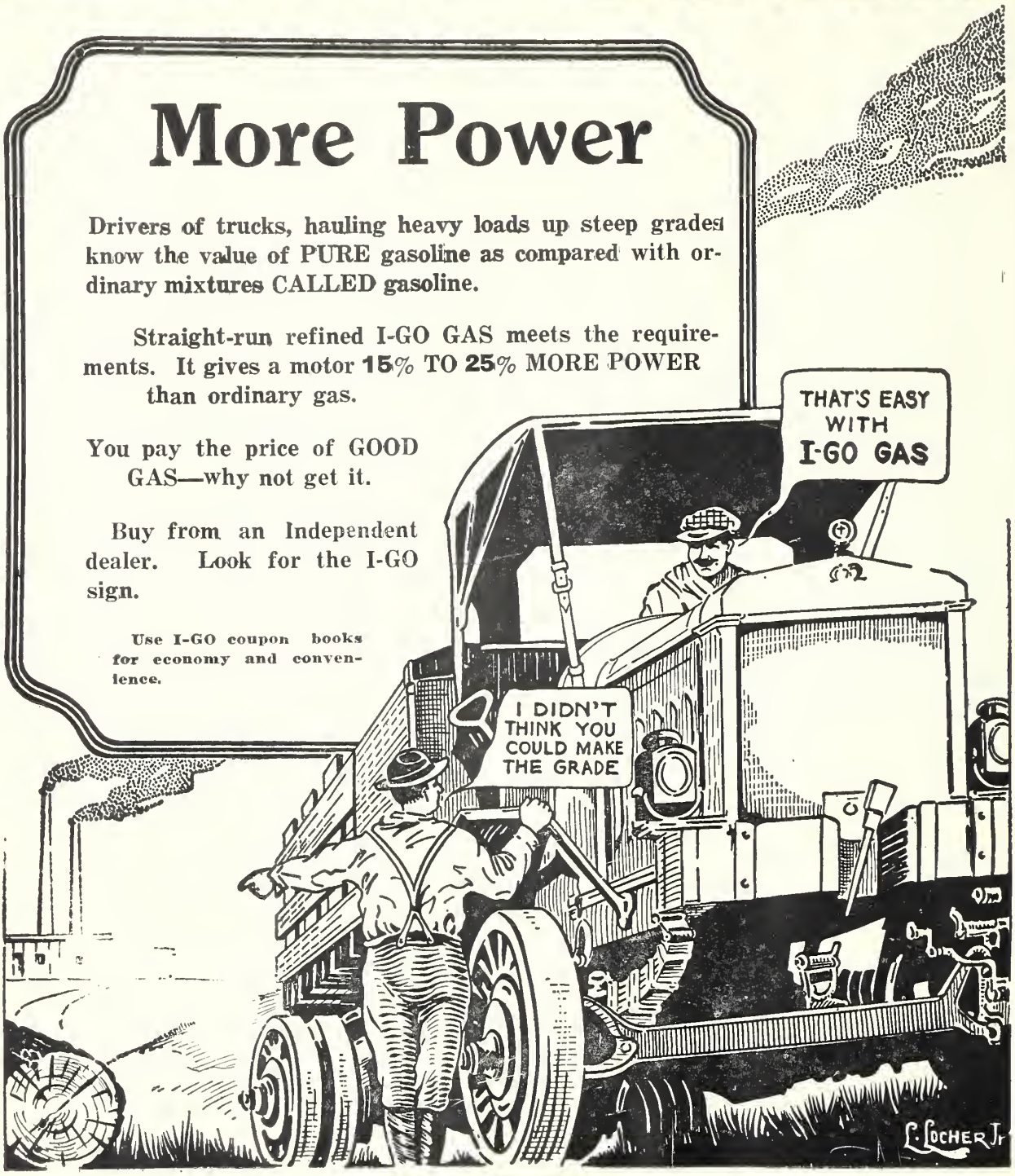

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Problems of Highway Location

By E. C. KNOWLTON, Assistant Engineer

Due to the suddenness of its growth and its present great magnitude few of our citizens really comprehend the extent and importance of our nation's modern highway movement. A few facts indicating its greatness might not be amiss.

There are at present 13,000,000 motor cars in the United States where in 1912 there were about 1,000,000. In the endeavor to keep pace with this great growth in number of motor vehicles with the necessary adequate highways, $1,000,000,000 per year is being spent for highway construction lines. In Utah we had in 1912, 2500 cars and we now have over 65,000. During the year 1923 there will be spent in Utah as purchase price for motor vehicles about $10,000,000 and to operate our 65,000 cars this year, an average of $800.00 per car, an additional $52,000,000 is spent. It is doubtful if the average person realizes that in this state there is actually being spent during this year a total of over $60,000,000 for motor vehicles.

It is obvious that the first step in the creation of the modern highway is its proper location. The location is indeed the foundation and this becomes one of the most important phases of the highway problem. Hundreds of thousands of dollars might be spent in the construction of a highway and if it is improperly located, at some future time a large part of this investment must be thrown away.

Evolution of Highway Location in Utah

The dust raised by the original band of pioneers had hardly settled before scouts were sent out to explore the surrounding valleys, and very soon thereafter main arteries of travel from one end of the state to the other were opened up, and these arteries soon became links in the great transcontinental routes over which road the great far western migration moved. It can be stated to the credit of these early road locators that in almost every instance, where physical obstacles were not too great for their meagre resources, they put the roads in the right location, and many's the time after the highway in a particular locality has been moved from the original location, and sometimes even removed again, that after applying all the engineering knowledge of the present day, the old trail is again adopted for the location upon which is built the modern highway. Their chief aim was directness, thus obtaining the shortest possible distance. The location of our mountain valleys, which can only be entered and left by suitable passage or crossing of the mountain ranges, are such that the general routes for the highways are quite closely defined by these passes, which are called control points. Between these control points the road was made by the pioneer locators as direct as possible consistent with the other elements of road and bridge construction. It is striking that the aims they had were similar to ours at present, that is, not only must local traffic be accommodated, but the interest of through traffic must also be considered. During the period following there arose two conditions which have tended to destroy this direct routing of the pioneer road builders. Towns sprang up in many cases off the direct line and as the land was surveyed the road was changed to follow such lines. This resulted in the establishment of many detours and right angle turns in the roads, and placed many of them off the line of directness. The coming of the transcontinental railroad made unnecessary the tedious transcontinental horse travel, and thus it might be said the highways ceased to be of importance as transcontinental arteries. From local standpoints the long detours were not objectionable, nor were the bad curves a handicap for team travel. The above condition took form during the period from 1870 to 1900.

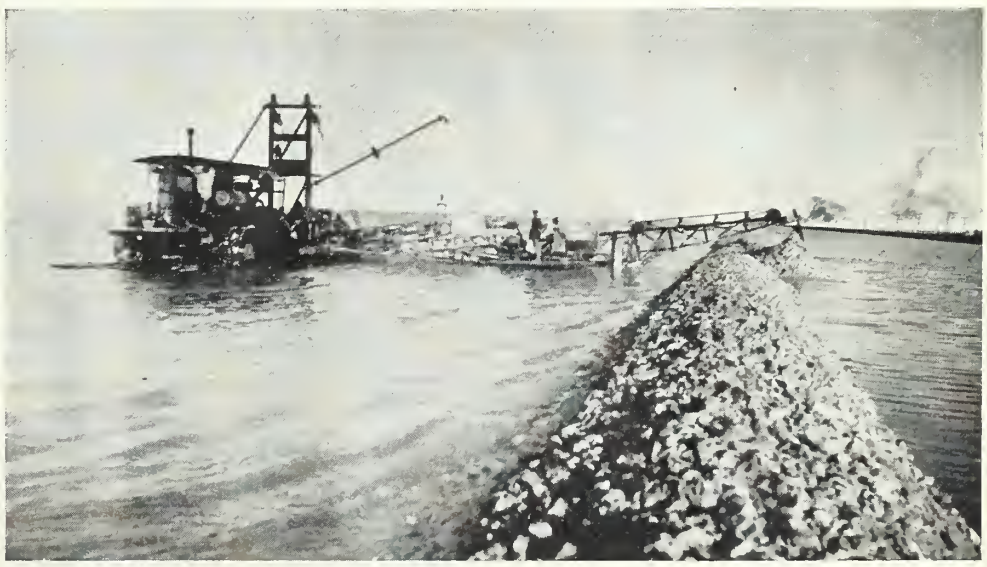
With the advent of the motor car unheard-of demands were made of the highways, and where before they were satisfactory for horse-drawn vehicles, they became entirely inadequate to meet the changing conditions. During the period from 1900 to 1916 great progress was made in improving our highways. Most of our roads were graded earth, the level road being raised above the ground by turnpike construction. Bad mud stretches were eliminated by graveling or changing the location of the road so that it traversed better natural material. In and near the cities and larger towns the traffic became so heavy that the natural material no longer was able to withstand it and these roads were graveled. In a few localities some hard surface paving was done. During this period transcontinental automobile traffic had hardly begun and consequently the adjusting of the highway location to take out unnecessary distance and other objectionable features was not very pressing, consequently very little of this was done.

The period of 1916 to 1921 marked a great expanse of the automobile industry in the United States, an increase that never had taken place in any other industry in history. With this increase transcontinental automobile traffic became indeed a reality. The automobile being the ever present demander for good roads there was brought to the attention of the whole country the need of adequate highways. It was plainly seen that the wealthy and populous states of the east and middle west must assist in the constructing of these transcontinental routes which are indeed owned by the entire country and not any one state, consequently there was revived and given impetus the great movement of federal aid for highways. In 1921 the congress, created the federal highway system, which laid out a connected system of national highways all worked into into a comprehensive whole. This law is the greatest step in the advancement and development of all highways of the United States since the advent of the motor car and for the first time in this country placed highway planning, financing and construction on a scientific basis.

Present Policy of the State Road Commission as to Road Location

The federal aid law is the outgrowth of the combined best thoughts and experiences of the entire country and its provisions and regulations form naturally the policy of the state road commission. With reference to highway location the following principles of policy are in force at the present time. These principles are fundamental and assuredly of self evident value to every far sighted citizen of our state:

It is necessary under our present condition to construct at one time only short stretches of our highways, that is, a few miles in each county, and between the stretches there are often long sections which will not be improved for some time to come. It is very vital in the location of these portions of the road to be improved that they are so located here that when the intervening section in the future are made there will be no need



Construction Scene on Salt Section of Wendover Road

to throw away part of the early construction due to its being improperly located, in other words, it is necessary to make a study of long sections of highway so that the particular piece to be improved will form a link in a perfect chain. The expense of grading highways and the permanent structures placed thereon are permanent in character, and the wearing surface, even if but gravel, will last a long time. Therefore, it is plainly seen that before any construction money is spent the highway should be so located that it presumably will not need to be moved at any future time and the original investment thus thrown away. The assumption is that most of our gravel roads are permanent foundations for future pavements and as much care is used in locating, laying grades for, and building structures on gravel surfaced roads as though they were to be paved at once.

Elements of Safety

The question of locating state roads is an important one. Railroad lines are planned and built with the safe assumption that traffic will be in charge of carefully trained men who will live up to definite and certain rules, but it can be truthfully said that highways must not only be safe for careful, sane motorists but must furnish, as far as is reasonably possible, safeguards to protect the lives of incompetent drivers. One of the greatest menaces to safety on highways is the existence of very sharp curves. It costs from $50,000 to $100,000 to build a highway over or under a railroad track to eliminate a grade crossing and it will be readily admitted that there are curves in many places as dangerous, and with as many deaths by accident to their credit, as the worst grade crossings. In fact, it is scarcely an over statement to say that every county has its "death curves."

In locating our modern highways no stone is left unturned to abolish these bad curves in so far as it is reasonably possible. At times opposition is raised by city and county officials because of the occasional necessity of procuring right of way for changing the road, which in some cases is over very valuable property, but after all, what logic or reason can be brought to bear to justify highway officials in imposing upon thousands, and in the future hundreds of thousands, of motorists the danger of a sharp curve when by an expenditure of a nominal sum it can be made safe.

Another source of danger on highways is the existence of "dugways," highways constructed on steep side hills. On mountain roads such construction is nearly always necessary, but the extent of this type of construction is minimized as much as possible and where it cannot be eliminated a guard rail painted white is provided at all dangerous points. At the present time careful study is being made to decide upon proper route down the Black Ridge in Washington county and the east side of Ash creek where the existing road now is, and where there are long stretches of high dugways. The danger of this condition will weigh heavily against choosing this route over the opposite side of the canyon where there is much less dugway.

One of the greatest elements of danger to highway traffic is the railroad grade crossing. Information published by the Union Pacific Railroad company shows that there are 250,000 railroad grade crossings in the United States and to eliminate these by underpass or overhead would require an expenditure of about $12,500,000,000, which is two-thirds of the estimated value of the nation's railroads. A comparatively small sum, however, would be required for the elimination of all "interstate highway grade crossings." Wherever it is possible highways are located to abolish the railroad crossing. Thus, in Juab county, where the highway crossed the railroad line and recrossed again about three miles further south, the highway was relocated abolishing both crossings. In this manner four grade crossings for through traffic were abolished at Salem, in Utah county, also two are being abolished near Fountain Green in San Pete county, and on several projects which are now in the preliminary stage it is planned to follow the same procedure. This is notably the case on the Echo-Emery 12-mile project where seven crossings will be abolished, and in Spanish Fork canyon, where in 25 miles 12 grade crossings are to be eliminated by revision of location or grade separation.

On roads crossing mountain summits, where snow trouble becomes a serious matter a careful study is made as to the selection of the route so that this trouble will be reduced to the minimum possible. Last winter these studies were made in several places, notably on the highway routes leading out of the Uintah basin. By making careful observation of the snow difficulty on the Salt Creek summit, north of Fountain Green, it was found that by changing the location of the road on this section it could be placed where the drifting snow was not nearly as severe as on the present road location and this revision is now under construction. It is expected that the serious snow trouble, which has been encountered every season in the past, will be almost entirely eliminated by this revision north of Fountain Green.

Economy of Location

The present policy in locating the roads is to make them as direct as possible. As is outlined in the beginning of this article, the regular direct routes in Utah were later diverted from the direct course to accommodate settlements which grew up, and now in sections where the country is heavily built up it is a serious matter to make radical line changes even though distance can be saved. However, I believe that few people realize what this item of distance saving means on transcontinental highways. On Federal Aid Project No. 17-B in Juab county we have been able to save a mile of distance by two line changes. To convert this saving of a mile distance on an important highway in terms of capital cost is interesting. Let us assume that three hundred vehicles pass over this road for two hundred days of every year (not heavy traffic when looking ahead a few years); that the cost of operating each vehicle is ten cents per mile and that at present a gravel road is to be built with a future hard surface.

Cost of one mile of graded road including culverts	$ 4,000.00
Cost of one mile of gravel surfacing	4,000.00
Cost of one mile of pavement surfacing	28,000.00
Cost of maintenance of one mile of road at $200.00 per year capitalized at 5 per cent equals	4,000.00
60,000 vehicles per year at 10c per mile equals $6,000.00, which capitalized at 5 per cent equals	120,000.00
Total	$160,000.00

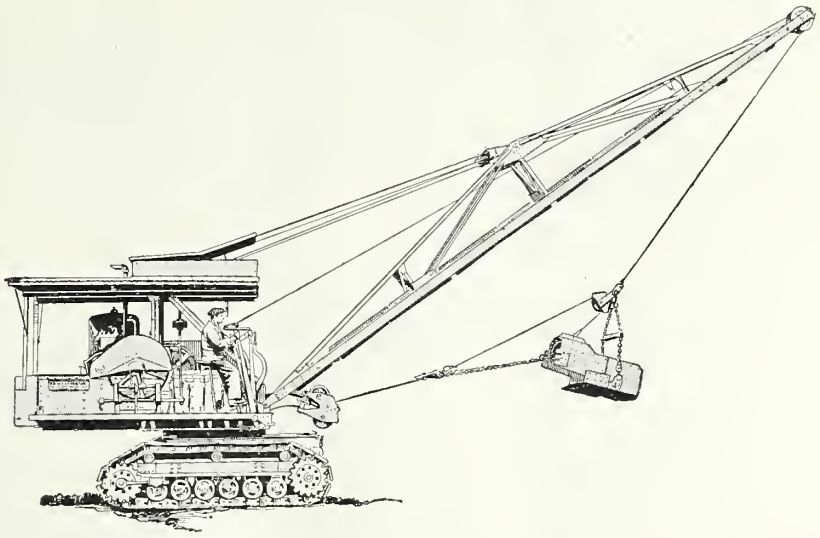
Considering the interests of the through traffic, which is increasing on our trunk highways by leaps and bounds, the policy of doing everything possible to save every foot of distance is certainly a sound one. To do this in many cases requires radical changes in location from the present road and at times makes necessary the missing of small settlements. Railroad companies spend millions to abolish bad grades and to save distance. The main highways are approaching the railways in importance, a well managed railroad figuring capitalization on much the same lines as above figured, and highway officials are now reducing grades and distance when they can consistently so arrange. Adverse grade on our highways is minimized as far as possible. Also much attention is given to keeping the rate of grade down to the lowest consistent limit. In Utah the maximum grade used is 6%, a rise of six feet for a hundred feet of distance. Grades steeper than this are at times used on mountain sections, but in future only under extraordinary conditions will a maximum of over 6% be allowed.

Summing up this matter of economical location it must be admitted that where a road is in the wrong place it is necessary to correctly locate it as soon as possible, before the adjacent country becomes even more built up or before money is spent on the highway which will be in a large measure thrown away. The commission and engineering department is earnestly striving to steer a reasonable course in this matter of changing location of highways. I believe that even though local interests are at times slighted our citizens in general realize the great importance of laying the foundations right. It is indeed gratifying to note the support that is being given by county officials, owners of adjacent land and public spirited citizens everywhere to the road betterment now in progress.

Cost of Preliminary Engineering

In closing this article a word might be said in regard to the cost of preliminary engineering which includes the survey and general preparation work before the project is put under construction. There are those who think too much money is being spent on this work. The present policy in this regard is to thoroughly study every possible location that the road might take. In places this requires the running of several alternate surveys and in some cases the obtaining of complete costs of different routes. The proper location of roads is a science and cannot be made by guess-work or rule of thumb, indeed, it is a science worthy of the most careful investigation.

P. & H. Draglines & Gas Shovels



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2. High grade motor with ample reserve power.
3. Can dig, crowd and swing simultaneously.
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6. Full revolving with large single piece casting as foundation for all hoisting, swinging and traveling machinery.
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8. Heavy all steel box section boom in one piece.
9. Simple rugged crowding motion driven by heavy steel thimble-roller chain from set of planetary gears.
10. Outside dipper sticks made of steel-sheathed oak planks, have a wide-spread connection at the dipper assuring a steady form support. Manganese steel rack and pinions.
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12. Heavy cast steel center pin with adjustment for wear. Full floating vertical propelling shaft.
13. Heavy structural underframe rigidly braced with swing gear acting as gusset.
14. Combined swing gear and roller track is an extra heavy steel casting with external cut teeth. Provided with spokes to keep center pin exactly in center.
15. Machine is mounted on heavy all steel non-cloggable corduroys. Two speeds.
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"To learn the facts" Illinois built an experimental road. Over a two-mile course, 63 different sections were laid. Three principal materials and every possible thickness and combination were employed.

Then fleets of motor trucks were sent over the surface. For many days and nights the loads pounded across that two-mile stretch. At intervals the weight was increased until finally each rear wheel of every truck was bearing 8,000 pounds. A total of 377,460 tons were carried over the road during the test.

At its completion only thirteen of the original 63 sections had survived. **Ten were of portland cement concrete.**

The other three had heavy foundations of the same class of concrete, that had been used without additional wearing surfaces in the first ten.

But many other sections built with the same "wearing surfaces," placed on less enduring foundations, were failures. An adequate thickness of good concrete, therefore, was the winning factor.

The test, equivalent to several years of normal highway traffic, proved that portland cement concrete assures the necessary strength and rigidity to meet the gruelling punishment of modern road demands.

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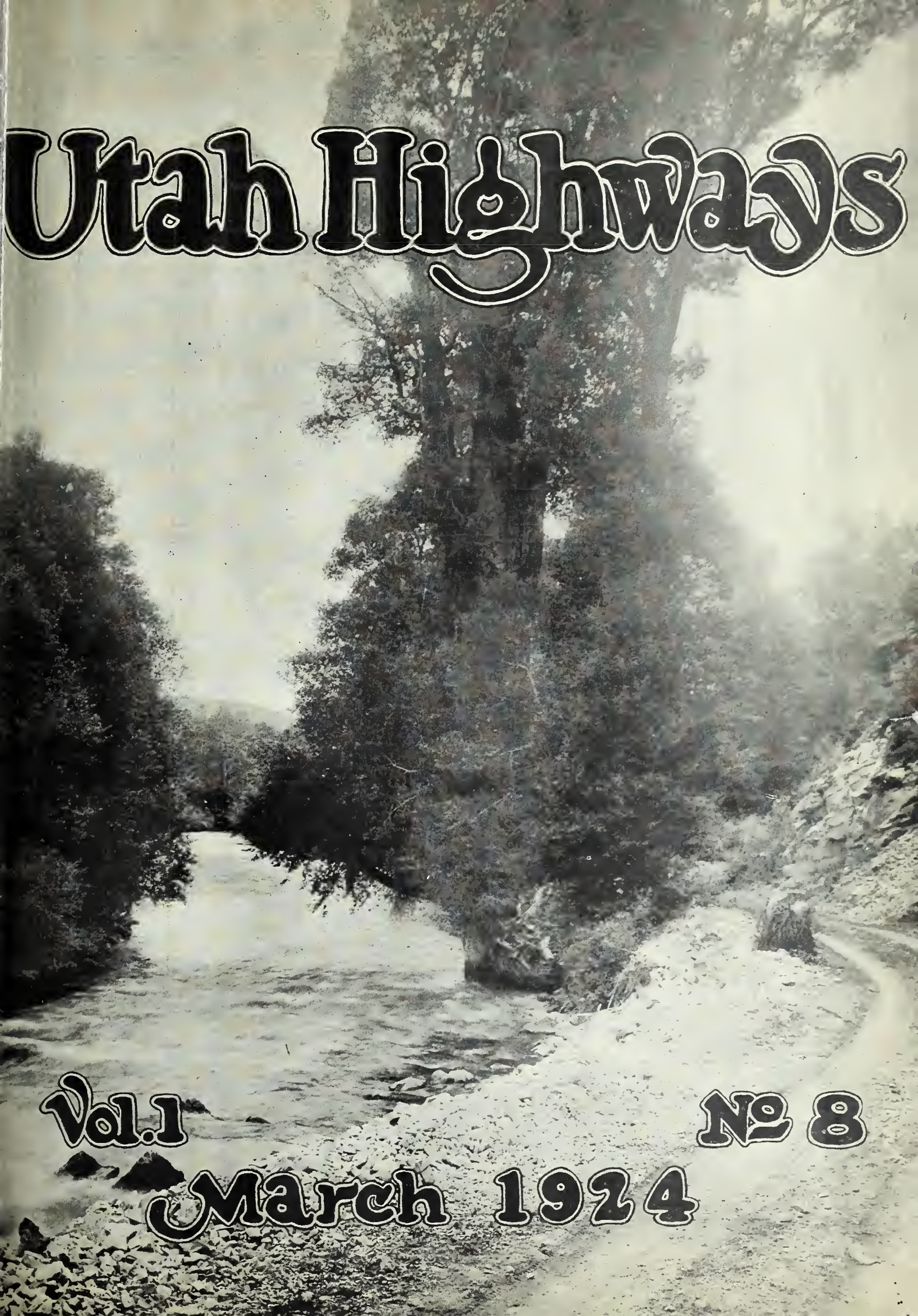
Utah Highways



Vol. 1 No 8

March 1924

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You know that Portland Cement Concrete Pavement is skid-proof, rigid, even and unyielding.

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Concrete Pavement consists of a definitely proportioned mixture of sand, pebbles or broken stone, and water, held together by the everlasting grip of that tenacious binder, portland cement.

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Utah Highways

VOLUME 1. MARCH, 1924 NUMBER 8

The Valley of the Great Salt Lake

When the Great Basin with its distant snowy peaks, its vast stretches of grey desert and the shimmering blue of America's wonderful salt sea unfolded before the gaze of the little band that marked the beginning of the great Mormon hegira across the plains, they doubtless thought that as scenery it was truly magnificent but that from the standpoint of its agricultural possibilities, it was all of one hundred per cent minus. This opinion was no doubt strengthened by the direful predictions of the famous scout, Jim Bridger, who met the party east of the Rockies, and who was so certain that no crops could grow and mature in such a forbidding locality, that he promised: "I'll give you a thousand dollars in gold for every ear of corn you can raise in that valley." And certainly a salt sea and a sun-drenched desert do not easily lend themselves to the mind as the handmaidens of fertility and the habitat of happy homes and prosperity. But, regardless of the fact that Bridger was an explorer and trader of renown and knew the intermountain country in 1847 as probably no other white man did, it turned out that he would shortly have had to pay to these settlers an amount sufficient to have satisfied the present German debt provided he had kept his wager and his gold mine held out. Two circumstances contributed to the complete transformation that was soon to take place in this silent desert and these were the height of the magnificent mountain ranges that encompass the basin and which hold the snows on their summits even until late summer and the other was the indefatigable zeal and enter-

The Wasatch Range from Salt Lake-Provo Highway

prise of these founders of a great state.

The sun-baked soil resisted and even turned the edge of the first plow that sought to upturn it, but the answer to the pressing problem of cultivation was found in the streams which were fed by the melting snows of the mountains; dams were constructed and the water diverted from its channels and spread out over the thirsty soil. Sufficient ground was watered and plowed by this method to furnish in the first year a small amount of food and forage and to indicate a highly productive soil, one capable of supporting the thousands which were preparing to swarm into the valley. And not only that, but this pioneer husbandry in July, 1847, on the site of which now stands Salt Lake City, marked the beginning of modern irrigation, and the reclamation of the arid west, a movement which is still extending and in which both public and private enterprise are actively engaged.

In spite of the hardships and difficulties accompanying the settlement of a new country, of learning to grow crops by the unknown and untried method of irrigation in lieu of depending upon the natural rainfall, farms and settlements rapidly increased in the valley and towns were founded to the north along the eastern shore of the lake at Centerville, Farmington and Ogden, and to the south, following the Jordan river and into the upper valley at Lehi, Provo, Springville and Payson.

Some seventy-five years ago, at the beginning of the great rush to the California gold fields, the Salt Lake valley and Great Salt Lake City, as it was then called, was the only charming spot on the whole two thousand mile journey from the banks of the Missouri to the Pacific coast. Here the tired caravans could rest and restock and refit for the remaining thousand mile drive across the deserts and mountains to the west or south. When it is considered that Salt Lake City is the mecca now for many thousands of overland tourists who rest in its limits and environs amid scenes that delight the eye, and arrive and depart by train or automobile, we can imagine with what pleasure it must have been reached by the emigrant trains, after a thousand miles of plodding over a dusty road, in crossing the monotonous and seemingly illimitable prairie that smarted under the rays of the summer sun.

At a very early period in its history Salt Lake has been described as a remarkably beautiful city. A fine system of irrigation watered the trees that lined both sides of the unusually wide streets and by clean cut ditches the water was diverted from these main channels into the gardens and orchards of the citizens. The houses, built of stone or adobe, and, later, of brick, were by a city ordinance set well back from the street, the intervening space being filled with flowers and shrubbery. Truly a gem in the wilderness and one rendered doubly attractive by its matchless setting in a trinity of mountains, valley and sea. Viewed from an eminence today the city appears one vast forest, the uniform sea of verdure being pierced here and there by an occasional church steeple or tall skyscraper in the business district, where, down the cement bound streets, the gutters continue to flow with fresh water as in pioneer days and a plentitude of bubbling fountains provide the thirsty with the purest and coldest of mountain water.

The labor of beautification has by no means been confined to Salt Lake and the other towns that cluster to the east and south of the lake, tall trees marching along in stately procession, line the roads and often mark the boundary lines of farms, and water from the streams flowing into the lake and frequently reinforced with flowing wells admit of the most intensive cultivation and there are miles of orchards along the highways, laden in season with full boughs of peaches, cherries, apples and every kind of fruit that can flourish in a temperate

Utah State Capitol Building, from State Street

climate and it is worthy of note that Salt Lake and vicinity enjoys the most equable year-round temperature of any inland region in the country.

Unquestionably for a city of so unique a historical and scenic background it is not within our province to attempt a detailed description of either; these and the resources of the valley, its mines and its smelters for the reduction of silver, copper and iron ores, and its many interesting geological features, such as the terraces on the mountain sides that mark the shores of a former lake of vast extent—have all attracted the labors of many pens and includes an impressive bibliography. It is sufficient that we indicate our appreciation of our favored location in one of Utah's fertile valleys and to say that with good roads and the hospitality we welcome the visitors to this state who come here either as tourists or with the intention of becoming a part of our community.

Viscount Bryce, in his "American Commonwealth" during a passing fit of ill-nature, perhaps, indulges in some strictures at the expense of the general run of American cities. "They are," he complains, "too much alike; they have the same monotonous squares of wooden houses, the same city hall, the same public library, the same Main street, where nothing has ever happened and probably never will. With all due respect to his judgment, we know that Salt Lake City at least, could not qualify under such a description.

Salt Lake City Wins in Contest

Since the lake, and the city by it, are among the chief attractions to the tourists coming to Utah, we quote a brief and comprehensive description of both given by Kenneth Read, local representative of Colgate & Company, at a convention in New York City. His address is of particular interest for the reason that the company had sent representatives to all the largest cities throughout the United States for the purpose of selecting the most attractive city to be found for the 1924 convention. The choice had narrowed down to two or three of which Salt Lake City was one, and after the following speech of Mr. Read, the choice of the delegates was almost unanimous for this city:

Mr. Chairman and Gentlemen of the Convention:

I feel highly honored and pleased to have an opportunity of giving you what I trust will be an interesting talk on my home town—Salt Lake City—my city beautiful. Salt Lake City and the Salt Lake valley is an oasis in the great American desert, nestling at the base of that great and majestic range of mountains—the Wasatch range of the Rockies—snow-capped the year round, marvelous in their majesty and proud of their protection. Beautiful canyons abound within their vastness. Most famous of all of these is Emigration canyon. In 1847, from a rocky knoll overlooking the Salt Lake valley, which was then nothing but sagebrush and sand, that noted pioneer, Brigham Young, made his famous decision, turning to his followers and, with out-stretched arms, said: "This is the place." These words, gentlemen, were the foundation of Salt Lake City. A few miles west of the city lies that great body of water, the Great Salt Lake, the largest inland body of salt water in the world—100 miles long and 25 miles wide. On the shores of this great lake is a world-famous resort, known as Saltair. This resort has one of the largest dancing pavilions in the world—it will accommodate 5000 couples on the floor at one time. One of the most remarkable features of this resort is the bathing. I have personally seen over 8000 people in bathing at one time. The density of the water is remarkable, containing 22% salt, and from my own personal observations, you can lie flat on your back, smoke a cigar and read a magazine, just as if you were sitting before your fireplace and in your own arm chair.

Photo Courtesy of Union Pacific Railroad.

Saltair Pavilion, Great Salt Lake

In the Great Salt Lake are many islands, such as Antelope and Bird islands. Antelope island is unique in the fact that it contains the largest single herd of buffalo in the world. A hunting permit can be obtained for the sum of $150.00, including transportation to and from the rendezvous. So you see, gentlemen, a real buffalo head and hide will cost you in the neighborhood of about $150.00. After a successful buffalo hunt we will return again to Salt Lake City.

You have doubtless read that Salt Lake City is one of the cleanest cities in the world. Wide streets—132 feet wide; beautiful trees and an abundance of foliage; mountain water from the snow-capped peaks of the Wasatch continuously running down the gutters. We have fifty schools, including four universities—the University of Utah, a well known seat of learning, the Latter-day Saints university of the Mormon church, Westminster college, under the presidency of the Presbyterian church; Rowland Hall for girls. We have fifteen parks and playgrounds, containing 340 acres. Numerous cool shady canyons in the Wasatch are a boon and a blessing to the residents of our fair city in the summertime. One of Salt Lake's most attractive features is the Temple square. The Temple itself is a beautiful example of pioneer architecture. This temple took over forty years to build and is

erected entirely of native granite. Imagine, gentlemen, the tremendous task involved in hauling this granite over the mountains by ox teams. This was surely a labor of love. The tabernacle in itself is unique. It contains one of the finest and largest organs in the world; has a trained choir of 550 voices. The acoustics of this tabernacle are famous. It is an actual fact that you can drop a pin at one end of the building and a person standing at the other end can hear it drop. What makes it most interesting to me is that my late father-in-law was one of the builders of this building. Anyone visiting Salt Lake City should not fail to take in the capitol building. The state house stands on an eminence at the head of State street, the longest straight street in the world. Salt Lake City is the center of scenic America. Within a radius of 500 miles there are nine national parks, unexcelled for their beauty, forms and colorings. I should like to dwell more upon these wonderful attractions of southern Utah, but time, gentlemen, will not permit.

Twenty-five miles south of Salt Lake City lies the town of Bingham Canyon, one of the seven wonders of the world. Here is located the largest copper mine in the world, owned by the Utah Copper company. The mining of this ore is unique. A huge mountain is tiered, in the process of removal, by the use of steam shovels and cars from one level to another. There is over a carload of blasting powder used each day. This town is built upon a narrow canyon, 300 feet wide and seven miles long.

Salt Lake City smelters handle more tonnage annually than any other city in the world. I will give you a few interesting details of the mineral production of our state. Utah produces more silver than any state in the Union. In 1912 silver to the value of $24,000,000 was mined. We also produce one-eighth of the nation's copper; one-sixth of the nation's lead, and one-fifth of the nation's silver. This, I contend, gentlemen, is a remarkable record and something that we have to be proud of in Utah. We are also the third largest producer of sugar beets.

As my limited time is drawing to a close, I wish to state that we extend to you all a hearty welcome to Utah. We are proud of our city and state. Our slogan is "See Europe if you will, but see Utah first."

A NEW MOTOR FUEL

Recent tests made in Australia with oil obtained from eucalyptus wood are reported to have demonstrated that fuel from this source possesses a high calorific value and this oil has been used in gas engines with marked success. Tests made with cars which could make twenty-four miles to the gallon of gasoline showed twenty-eight miles with half gasoline and half eucalyptus oil and thirty-six miles with the eucalyptus fuel alone. One advantage in using the mixed fuel is that the engine starts more easily from cold than with eucalyptus gas alone.

The eucalyptus tree has been transplanted with success in southern portions of the United States and the fact that it is of extremely rapid growth makes the news from Australia of interest to this country.

West Line Over Black Ridge in Washington County

By E. C. KNOWLTON, Assistant Engineer

The difficult problem that has been long before the road builders of the state: that of deciding whether the permanent location of the Zion Park highway should surmount the Black Ridge, in northern Washington county, by way of the east or west side of Ash Creek canyon has been finally settled.

After the survey of the two main alternate routes and careful consideration of the problems and costs involved in the construction of an automobile road of present-day standards on either side of Ash creek, both state and federal officials have decided that the west side offers the better location and that is where the road, as Federal Aid Project No. 55, will be built, the approved location constituting a return to the first road built over the Black Ridge.

The original road through this region, the old Mormon Trail to southern California, ran through a less rugged country, on the opposite side of Pine Valley mountain via Mountain Meadows and Santa Clara and west of the present road that was later constructed when the climate and soil in what is now Washington county attracted their quota of pioneers and settlements increased in the valley of the Virgin river. With the growth of these settlements an outlet directly north became necessary and the only feasible one offered for a highway both now and then was that ascending the canyon where Ash creek has worn its steep and tortuous way through the great Hurricane fault.

Topography of Black Ridge Section

It is at the head of this canyon that what is known as the Black Ridge section of the Zion Park highway begins and it is here that the road begins its series of most rapid descents from the high plateau of southwest Utah: 6000 feet is the elevation two miles south of Cedar City on Project 54 and 5000 feet at the beginning of the Black Ridge section seven miles further south, from which point the road takes a drop of 800 feet in three miles and so on in a succession of gradual and steep descents to the valley of the Virgin and St George, the capital of Utah's Dixie where the elevation is only 2800 feet.

The west wall of Ash Creek canyon has a height of from 200 to 400 feet beyond which lies a plateau region that rises toward the north to the summit of Black Ridge, while on the east side the steep mountain slopes continue without break to the bed of the stream.

The ground on either side of the canyon can hardly be called soil as it is so thickly interspersed with, and almost covered and obliterated by the black boulders which appear to have been showered upon the earth like hailstones through which occasional scrub cedars and grub brush struggle through and maintain a precarious existence.

The boulders on the west side are even more numerous and more difficult to move aside for a roadway than those on the east but when the route of the original road was changed to Ash Creek its builders were compelled to take the west side as the expensive dugway construction on the east was beyond their resources. The only recourse in those days was merely to remove the most offending rocks to one side, making a trail over those of less abrupt surface, the resulting passage way being composed literally of one rock after another.

There was probably no more troublesome section anywhere on the road to southern California and it sorely tried the hearts of its users from the time the first ox team lumbered over the black rocks into Dixie.

As an example of the ingenuity of the early pioneers in contending with the difficulties of the overland trails, it is a

The Ash creek bridge, near south end of project

Present road on east side of Ash creek

pleasure to note the origin of the name of Peter's Leap creek, which flows into Ash creek just north of Pintura. Peter Shirts, pioneer of southern Utah, located an Ash creek road so far to the west, that it reached the tributary of Ash creek where a deep gorge blocked further progress, but Shirts, undaunted by lack of funds to span the opening, proceeded to construct a windlass by means of which wagons could be raised or lowered to or from the creek bed, the oxen in the meantime being led over a narrow trail to the new point of altitude and departure. The wagoneers dubbed the place "Peter's Leap" and so from this, the first elevator operated in Utah, Peter's Leap creek took and retains its name.

After the west side route had been used as a road for a number of years and resources in the meantime had become available, it was decided to change the location to the east side of Ash Creek canyon and after years of tedious labor the present road, constructed on a dugway, came into existence. This change undoubtedly had advantages as it did not require the dreaded climb from the bed of Ash creek, from what is known locally as the old Kelsey ranch to the top of the dugway, also enough soil was found intermixed with the boulders along this east route to make possible a smooth roadway. This, the present road, is, however, one of the most dangerous of any improved road in the entire state. It is located high up on the canyon and cut out of the very steep mountain slope. The roadway is at present very narrow and the grade in places extremely steep, and almost the entire extent of this stretch is made up of sharp curves. This combination of road dangers has resulted in a full share of fatal accidents. In 1919 the section from Cedar City to St. George was put on the program for improvement and survey was made at that time selecting the west side of the Black Ridge for the location. However, there were no funds available for construction and nothing further was done until the spring of 1923, at which time the state road commission decided again to consider the reconstruction of this very objectionable piece of road. For the purpose of comparison a survey was made along the east side and it was found that about one-third of the dugway, and much of the dangerous curvature could be eliminated. At this stage it was thought that the east side was perhaps the more feasible, especially considering the fact that a new bridge would be required over Ash creek for the west side location. However, a careful estimate of the quantities involved showed that it would be necessary to excavate approximately 100,000 cubic yards of material on the east side in 3.6 miles, in order to build a roadway of present standards.

With the above information at hand it was decided to make a careful estimate of the west side and the old survey of 1919 was revised with several improvements. Deposits of earth materials in pockets were found at strategic points which could be used to build the grade partly in embankment thus eliminating much expensive rock excavation. The resulting estimate of the west side reveals that even including the cost of the new bridge, the road can be built on that side of the canyon for many thousands of dollars less than the east side; also that the present bridge on the east side is improperly located, there being dangerous curves as approaches to each end, and then, too, the design is light as compared with the present standards, and it would not be many years before a new bridge would be necessary at this point.

Other Factors Governing Selection of West Side

Besides the question of costs, which was the fundamental one, the following outstanding factors were influential in the selection of the west route:

There is practically no difference in the length on either side, the east side being only 600 feet shorter.

A very serious disadvantage to the west side location, perhaps the only one, is the existence of 175 feet of adverse grade. In other words, the top of the Black Ridge on the west side is 175 feet higher than the same point on the east side. There is, however, along the present route, 40 feet of adverse grade on the Black Ridge section. This difference of 135 feet is a perpetual handicap, especially as it requires practically a 6 per cent grade to negotiate it. For a comparison of grades on either side between the Ash creek bridge and the Iron county line, it may be noted that on the east side, the present road location, there exists 4600 linear feet of grade between 5 and 6 per cent and 6900 linear feet of grade between 4 and 5 per cent. On the west side there will be 8,000 linear feet of grade between 5 and 6 percent, and 3000 linear feet of grade between 4 and 5 percent. From a point of view of safety, the west side has a distinct advantage in that it is almost free from sharp curves and side hill locations, while the east side with its long dugway section with accompanying excessive curves and steep grades, presents a condition of danger that is probably second to none in the state. On the west side there are about five curves with a radius under 500 feet with a total curvature of 260 degrees; while on the east side there are ninteen curves under 500 foot radius, with a total curvature of 1075 degrees.

It is realized, of course, that the improvements which would be made on the

(Continued on Page 7)

First house in Southern Utah, built in 1849 by Jacob Hamblin, town of Santa Clara.

Utah Highways

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H. V. RICHARDS, Editor

THE FACTS ON OUR CONCRETE PAVEMENT

The following criticisms in regard to the wearing qualities of the concrete pavement on our state roads, appeared recently in one of our county newspapers:

> "The piece of Portland cement paving, extending from Payson to Spanish Fork and in fact practically every other piece of cement in this state, is showing signs of disintegration. The Payson-Spanish Fork paving is already going to pieces and it has not been in use more than a year. Pavement between Springville and Provo, which is but a couple of years old, is likewise badly in need of repair. The people who are working so hard to force on the public Portland cement paving should see to it that the state gets a better class of work, otherwise Utah will soon be putting down nothing but the black type of paving. That the bitulithic paving is the better of the two types is now quite generally conceded."

The author of the above editorial is apparently sincere and wholly pessimistic in his summarization of many years of effort, on the part of the state road commission and county commissioners of eleven counties in building concrete roads, and in the results the state has to show for the expenditure of five and a half millions of dollars.

The statement that the Spanish Fork-Payson pavement is going to pieces is presumably founded on the observation that after two years of use, a few cracks appear which have not yet been repaired by the county maintenance crews. On pavements built prior to 1923, without a center joint, longitudinal cracks do sometimes appear along or near the center of the pavement and transverse cracks, due to temperature stresses, are occasionally noticed, but a statement that the efficiency of the pavement is impaired on this account or that it is wearing out is quite without foundation.

We could take, with a few grains of salt, such a criticism on the part of a salesman of another type of pavement: that this and practically every other piece of "cement" in the state is showing signs of disintegration, but since the writer of the article does not claim such affiliation, we feel that his conclusions should not go unchallenged:

Concrete roads were first built by the state road commission eleven years ago, when this type of surfacing was in the experimental stage. Convict labor was largely used and bank-run gravel and other inferior materials frequently entered into the construction, and the problem of drainage did not receive the attention that it does now. Notwithstanding all these handicaps, these old concrete roads continue to be used year after year with only minor costs for maintenance. Although all the earlier pavements are on the Salt Lake-Ogden road which carries by far the heaviest traffic in the state, there have been no extensive paving repairs, and none are being considered except the four miles between Clearfield and Layton where a roughened surface renders a resurfacing desirable. Engineers who have recently inspected the pavement on this stretch, say that its condition does not indicate any serious failure, and that the slab will serve indefinitely in its present state or as a base for resurfacing.

The first concrete pavement built by the commission was from Salt Lake to Centerville, in Davis county. From Centerville to Bountiful a pavement of bituminous type was laid five years later, in 1919. For a comparison between the two, from point of service rendered some interesting comments can be had at any time from the citizens of Davis county. They strongly favor concrete.

We do not wish to go on record as favoring the construction of either type; we know that properly constructed, they are both good types, and specifications for black top pavement on a rigid base has frequently appeared as an alternate in the proposals issued by the commission for hard surface pavement.

In answer to the assertion that materials and inspection on our present paving contracts are inferior, it may be stated that the commission employs engineers who are experienced and competent in the testing of all the materials by every known method, that enter into the construction of a pavement, and in requiring that every operation connected with mixing the materials and in laying finishing and curing the concrete be in accordance with the most approved methods.

OUR COVER PICTURE

This month's cover picture is a view on the Kamas Stockmore road where it follows the water grade of the upper Provo a few miles above Woodland, in the Wasatch National Forest, one of the largest and most important of the ten national forests in Utah. It extends from Provo canyon north to City creek, north of Salt Lake City and including on the easts the north and west slopes of the Uintah range. Headquarters for this reserve are located in Salt Lake City. Included within its limits are, a part of the headwaters of the Green river, and the headwaters of the Provo, Weber, and Bear rivers, together with many of the smaller streams that flow into Salt Lake valley.

The timber species of Utah include western yellow pine, engelman spruce, lodge pole pine and douglas fir. There are in addition, in the Wasatch and Uintah forests, vast tracts of quaking aspen awaiting the forest development roads and which will in time furnish a large supply of suitable timber for pulp mills throughout this region. The Wasatch range contains large quantities of merchantable timber, the heaviest body in the state, however, being located in the Uintah range, which is estimated to contain three billion feet of high-grade timber.

In the construction of roads for forest development and administration it must be borne in mind that federal and state highway officials do not consider the timber resources of these reserves and their development of prime importance, on the contrary the sawmill lumber in the mountains, is of itself, of the least value present or potential offered by the reserves in the development and continuation of the state's prosperity. The control of run-off is the primary consideration. Far below the timber belt lie the irrigated farms, dependent entirely upon the snows that accumulate in the mountains and Utah's basic industry is dependent upon the forests for the regulation of the stream flow. The rapid descent of these streams furnish many sites for water power development and along the streams issuing from the Wasatch reserve are power plants developing 120,000 horsepower which is entirely absorbed in supplying with power and light the Ogden-Salt Lake-Provo district. In no state is the demand for range privileges for the grazing of livestock greater than in Utah, and the handling and distribution of sheep and cattle in the forest areas, so as to provide for the greatest possible number, and still retain the watershed value of the mountain slopes, is one of the pressing problems of forest administration which is further complicated by the fact that the sources of water supply for cities and towns in the thriving valleys below must be kept absolutely pure and unimpeded in flow.

Black Ridge West Line in Washington County

(Continued from Page 4)

east side, over the present dangerous conditions, would be great, but it is quite probable that with the improved condition in alignment and grade, careless drivers would lose the fear that the dangerous condition instills, and the improved road might actually have as many accidents as would be caused by the present one. The obstacle against using the east side, which seems insurmountable, is the question of detouring traffic during construction. It would be absolutely out of the question to do any construction on the dugway sections of the east side during the tourist season. The road during construction on this section would have to be entirely closed to wheeled traffic, and even mail would have to be transferred by horseback. By doing the work in the wintertime a minimum of inconvenience would result but the sealing of this road to traffic would be a serious matter, indeed. A detour for light traffic could possibly be provided from St. George by way of Enterprise and New Castle to Cedar City; this would add 25 miles to the distance. Traffic from Hurricane section would, of course, be even more inconvenienced from the point of view of distance. The detour problem would not only be acute for the gravel surface construction, but would be even more serious when the future pavement is built.

Another advantage in building on the west side is that of having a cattle road apart from the main traveled way. By choosing the west side the present road can be dedicated as a cattle trail and in addition to removing this annoyance to traffic, would do away with the serious damage done highways by driving stock over it, which is especially serious on side hill work where the road is on a grade.

This problem and its solution is an example of the present policy of road location in this state. There are those who think that it is only necessary to run a line of stakes through a region in order to decide immediately the best place for a highway location. Many costly mistakes have been made in the past due to those practices. For several months during the past year, in fact during all the early stages of these investigations, it was thought by those in charge that the east side was the more feasible, and it was not until all the facts were ascertained that the superiority of the west side became apparent.

Who will question the wisdom of spending enough money during the preliminary stage of highway building in order to make an intelligent scientific conclusion, and with all the pros and cons before us for full consideration, rather than to hastily embark upon an ill-considered program involving huge sums of money in the building of what may prove to be a mistake and one which will be tardily, if ever, rectified?

Wyoming oil fields must produce a lot of high-test gas, judging from the Tea Pot Dome explosion.

Headwaters of the Provo, Wasatch National Forest

COOPERATIVE FUND FOR FOREST ROADS AND TRAILS APPORTIONED

Twenty-eight states in which national forests are located wholly or in part will share in the distribution during the current fiscal year of the $1,000,000 fund appropriated by congress annually for the construction of roads and trails within the national forests in cooperation with local authorities, according to the apportionment recently approved by the chief of the forest service and the secretary of agriculture. Alaska and Porto Rico will also share in the distribution of this fund, commonly known as the Section 8 fund.

Last year 27 states shared in the federal moneys, Pennsylvania having been added to this year's list following the establishment of the Allegheny national forest in that state. This particular fund is expended only under cooperative agreements with state and local authorities and should not be confused with other road-building funds expended upon roads and trails within the national forests.

Following are the states and the amounts each will receive: Arizona, $54,209; Arkansas, $9,732; California. $126,822; Colorado, $67,537; Idaho, $114,764; Montana, $64,889; Nevada, $17,164; New Mexico, $37,945; Oregon, $136,686; South Dakota, $7,495; Utah, $38,319; Washington, $85,741; Wyoming, $45,201. Alaska receives $43,919.

Florida, Michigan, Minnesota, Nebraska, North Dakota, Oklahoma, and Porto Rico will together share in $13,980. Alabama, Georgia, Maine, New Hampshire, North Carolina, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia will together share in $35,597. The sum of $100,000 is reserved for administrative and equipment expenditures and special contingencies.

Gasoline Tax Apportioned for State Road Maintenance

By GAM HAYWARD, Office Engineer

The road commission has been advised by the state auditor that receipts from the gasoline and motor vehicle tax for 1923 have made available for the state road maintenance fund the sum of $149,490.28. This sum represents the net proceeds from the above sources of revenue after the annual interest and sinking fund charges on state road bonds and the expenses of operation of the motor vehicle department, have been deducted. On account of the wording of the statute the receipts for December, over $45,000, are not due and collectible until January 15th, so are not included but become a part of the tax collections for 1924. Since the law did not go into effect until March 8 of last year, we have receipts therefore, from less than nine months operation of the gasoline tax with which to pay the fixed charges for the year and furnish the maintenance fund for 1924.

It is the intention of the commission, when receipts from the gas tax become sufficiently large, to ultimately take over for maintenance, the state road system in its entirety without allocation of funds from counties. Since the funds available this year are, however, not more than half the lowest sum estimated to be consistent with a fair standard of maintenance of the system, about 50 per cent of the amount required for this year's operations will have to be paid from the state road tax of the counties. It has, therefore, been necessary to arrive at some basis of distribution of this tax among the 29 counties for the season of 1924.

This distribution has been the subject of much study on the part of the commission. They have carefully gone into the matter of assessed valuations, state road tax levies for the past year, road mileage of each county, the federal aid and forest highway mileage now completed and requiring maintenance, the types of completed roads and the relative importance to traffic of the various roads composing the system.

After the consideration of several plans it was finally decided that the most feasible and equitable method of distribution would be to classify the roads as to traffic and other conditions, fix the lowest mileage cost consistent with proper maintenance, and then budget for each county an amount equal to one-half of the sum so ascertained. Any sum, up to the amount budgeted, that a county makes available for maintenance from its state road tax fund is to be matched dollar for dollar by the state. In determining the budget, the following classes were established:

Class A, at $200 per mile, includes all hard surface roads and completed federal aid projects of any type that carry a heavy traffic.

Class B, at $150 per mile, graded earth or gravel roads constructed to a high standard, such as federal aid projects, but which are not subjected to heavy traffic; such for example, as the federal aid projects between Moab to LaSal Junction, and between Price and Ferron, and also roads not improved to such high standards but carrying considerable traffic as the Silver City to Santaquin highway and from Tooele to the Salt Lake county line.

Class C, at $100 per mile, for forest and other state roads which have not been improved to a type which would warrant greater maintenance expenditures as, for example, some few portions of the Zion Park highway including all the mileage from Anderson's ranch south to the Arizona line, and in eastern Utah, from Price to the Colorado line.

Class D, at $50 per mile, for those roads which are only partially improved or over which the traffic is very light.

In addition there are a number of state roads budgeted on a lump sum basis where their remote location with reference to through routes of travel, and the type of construction and degree of use, does not justify further expenditures other than for emergency repairs.

The following tabulation shows the basis on which the maintenance budget was determined, the miles of road under the several classifications, and the total mileage for each county. This mileage includes all state highways within corporate limits of cities and towns irrespective of population, inasmuch as the commission considers such highways as part of the state road system and eligible for maintenance by the gas tax.

MILEAGE DIGEST OF MAINTENANCE BUDGET

County	Class "A" ($200)	Class "B" ($150)	Class "C" ($100)	Class "D" ($50)	Lump Sum Mileage	Totals
Beaver	9.6	.....	54.7	31.1	.....	95.4
Box Elder	18.6	20.1	20.9	44.1	103.6	207.3
Cache	35.3	7.8	35.0	.....	.....	78.1
Carbon	11.1	18.5	39.1	35.9	.....	104.6
Daggett	.....	.....	.....	22.0	.....	22.0
Davis	26.5	.....	6.8	.....	.....	33.3
Duchesne	.....	40.5	38.9	60.9	.....	140.3
Emery	.....	32.8	58.3	18.5	.....	109.6
Garfield	.....	.....	22.2	113.8	.....	136.0
Grand	.....	45.2	74.1	.....	.....	119.3
Iron	9.5	33.3	86.2	52.7	.....	181.7
Juab	37.0	9.4	7.0	13.9	.....	67.3
Kane	.....	.....	25.6	38.0	.....	63.6
Millard	60.8	2.0	34.6	.....	.....	97.4
Morgan	7.8	.....	16.1	.....	.....	23.9
Piute	.....	12.6	23.1	15.0	.....	50.7
Rich	.....	10.1	53.9	12.0	.....	76.0
Salt Lake	60.5	.....	.....	.....	.....	60.5
San Juan	.....	16.0	.....	116.1	.....	132.1
Sanpete	11.6	12.4	55.0	41.3	.....	120.3
Sevier	6.0	11.4	129.4	2.1	.....	148.9
Summit	6.0	11.4	129.4	2.1	.....	148.9
Tooele	.....	13.5	.....	.....	187.7	201.2
Uintah	6.7	.....	56.9	.....	.....	63.6
Utah	39.0	50.3	57.3	.....	.....	146.6
Wasatch	.....	61.6	25.0	.....	.....	86.6
Washington	7.3	.....	130.9	27.7	.....	165.9
Wayne	.....	.....	12.0	.....	80.0	92.0
Weber	33.3	.....	18.8	.....	.....	52.1
	380.6	429.6	1132.6	607.1	371.3	2921.5

Heretofore, except where a new road or bridge has been constructed all the work performed by the forces under the state road agent in each county, has been classified under the general head of "Maintenance." As a matter of fact, considerable expensive work is performed each year by these maintenance crews, which is not strictly a maintenance operation, such as the building of retaining walls or snow fences, inserting a higher type of culvert in the roadway than the one it replaces, placing gravel or shale on an earth roadway. This class of work is a betterment to the existing roadway and in a recent ruling of the commission, the following definitions are given:

"Maintenance: Maintenance is that work which is necessary to keep a given roadway or structure up to a certain standard so that its value is the same as when originally completed or constructed."

"Betterment: Betterment is any work which increases the value of any roadway or structure."

The law authorizing the collection of the gas tax specified that the proceeds turned over to the state road fund shall be used for maintenance and maintenance

above defined is the work which the mission will undertake to cooperate, ing the counties to provide funds ough the state road tax for the class work described as betterments.

The county commissioners have been uested to deposit at once with the te treasurer 25 per cent of the coun- s portion of the estimate for the sea- 's work, to which will be added an ial sum from the state fund which l be used to carry on maintenance rk in the county. It is not considered essary or advisable that the county ke available its entire portion of main- nance costs at the beginning of the ason, but as the maintenance fund is ed, additional amounts will be required and where the total amount budgeted is not spent during a season the state and county's portion will be reduced equally.

The following table shows the assessed valuation, the state road tax and the rate for each county in 1923. Three mills is the maximum rate allowed by law in levying this tax. Other columns show the amount budgeted for each county as derived from the table printed above, and one-half of the state's share from the gas tax, which is also the county's share to be paid from its state road tax. The total amount budgeted is $296,650, which is very close to an average of $100 per mile for maintenance over the entire system.

MAINTENANCE BUDGET, 1924

County	1923 Ass'd Val.	1923 St. Rd. Tax	1923 Rate (mills)	1924 Budget	State's Share Gas Tax
eaver	$ 6,430,807	$ 6,382.97	1.0	$ 8,946	$ 4,473
ox Elder	37,399,267	18,698.44	.5	11,290	5,645
ache	31,520,791	6,304.15	.2	11,730	5,865
arbon	27,388,351	13,694.18	.5	10,700	5,350
aggett	538,726	538.73	1.0	1,100	550
avis	19,072,777	19,072.78	1.0	5,980	2,990
uchesne	5,237,550	5,235.96	1.0	13,010	6,505
mery	7,716,170	23,148.51	3.0	11,676	5,838
arfield	2,294,225	5,047.29	2.2	7,910	3,955
rand	4,763,106	14,289.31	3.0	14,190	7,095
ron	7,411,493	22,234.47	3.0	18,150	9,075
uab	17,321,648	34,643.30	2.0	10,006	5,003
ane	2,216,676	6,658.28	3.0	4,460	2,230
illard	16,085,407	24,126.26	1.5	15,920	7,960
organ	5,366,439	13,364.83	2.5	3,170	1,585
iute	2,698,897	1,349.44	.5	4,950	2,475
ich	3,063,338	2,857.28	1.0	7,506	3,753
alt Lake	256,953,167	51,390.63	.2	12,100	6,050
an Juan	2,496,379	7,489.51	3.0	8,206	4,103
anpete	15,361,787	15,361.57	1.0	11,746	5,873
evier	12,059,786	18,087.72	1.5	15,956	7,978
ummit	16,090,611	45,054.27	2.8	12,900	6,450
ooele	17,553,223	8,776.24	.5	7,026	3,513
intah	6,540,430	16,351.07	2.5	7,030	3,515
tah	52,019,520	156,058.37	3.0	21,076	10,538
Wasatch	8,452,728	21,131.82	2.5	11,740	5,870
Washington	3,137,802	9,413.40	3.0	15,936	7,968
Wayne	1,157,888	1,736.69	1.5	3,700	1,850
Weber	58,402,294	60,734.42	1.04	8,540	4,270
Total	$646,751,483	$629,236.91		$296,650	$148,325

Sparks From the Road Drag

HISTORY REPEATING ITSELF

Hart: "You little thought a week ago that you would be sitting here in the park tonight with a man you didn't know then."

She: "Oh, yes; I did."

Hart: "Why, dearie; how could you have known that?"

She: "Well, we have had road builders around here before."—The Earth Mover.

THE ROAD HOG

The road hog went his merry way
And he was going west.
To crowd 'em over and crowd 'em off
He did his level best.

Another road hog hove in sight
And he was coming east,
To crowd 'em off and crowd 'em off
He cared not in the least.

They met—two piles of junk lay by;
Ha ha! we laughed—and then,
Out crawled the charmed degenerates
To hog the road again. —A. S. G.

A highway builder's word should be as good as his bond.

A woman came into the Bank of North Lake one day recently and made a deposit of several items. After ascertaining the amount, Burton M. Smith, president of the bank, asked, "Did you foot it up?" "No, I rode over," said she.—Milwaukee Banker and Manufacturer.

The difference between Satan and the road department is that the former makes his detours more enticing.—Knoxville Sentinel.

You should never interfere with a pedestrian who is beating it away from a speeding auto for the curb. He is making a non-stop flight.

NO TIME FOR TROUBLES

Agent (entering office)—I've an attachment for your typewriter, sir.

Busy Man—Well, settle it with her. Your love affairs are no concern of mine.

FULLER BULL

There were muffled sounds of a struggle in the other room, and a girl's voice squealed, "Stop!"

No response.

"Oh, please don't. Mother said—"

No response.

"Oh, wait just a minute, please."

No response.

"Let me go this minute."

"One more yank and I'll have it out," consoled the dentist.

ALMOST BROKE HIM

Mary: "Did you take father apart and speak to him?"

John: "Not exactly; but he almost fell to pieces when I spoke to him."

HEARD VOICES

A psychaltric board was testing the mentality of a negro soldier.

"Do you ever hear voices without being able to tell who is speaking or where the sound comes from?"

"Yes, suh," answered the negro.

"And when does this occur?"

"When I'se talkin' over de telephone."

OH, MR.

She was peeved and called him Mr.
Not because he went and Kr.,
But the thing that made her sore
Was, that on the night before
This same Mr. Kr. Sr.

EDUCATION

"Yaas, our son is learning French and algebra, you know. Son, tell the lady how to say good morning in algebra."

THE RETORT COURTEOUS

The Salvation Army Lass had approached a group of young sports standing on the corner and one of them, as she held out her tambourine, took a nickel from his pocket and said, freshly:

"If I give you this nickel, will you say a prayer for me this evening when your pretty head touches the pillow?"

"I'll say it now," she replied, and as he dropped in his nickel she lifted her face and said:

"O Lord, make this young man's heart as soft as his head."

A highway financing bill introduced in the Arkansas legislature provides for a tax of 4 cents a gallon on gasoline, a tax on automobiles of 12 cents per horse power and 55 cents per 100 pounds gross weight, a tax on trucks ranging from $25 to $500, and on motorcycles, $10 flat. The minimum tax for automobiles would be $15.—Good Roads.

Dyer—I understand your wife suffers from car sickness.

Ryer—Yes, it makes her sick to think we can't afford as good a car as our neighbors.—Ex.

Lee said that the guard rail was so crooked that every time he crawled through it he came out on the same side.

"Now that they have found King Tut, where is September Morn?" murmured Scotty.

Status of Federal Aid Projects

By F. S. THOMPSON, Chief Draftsman

UNDER CONSTRUCTION MARCH 31, 1924

No.	County	Name	Type	Lgth.	Per Ct. Comp.	Contractor	Estimated Cost
4-F	Emery	Castle Dale-Ferron	Gravel	11.5	83	J. T. Raleigh Co.	$114,76[illegible]
4-H	Emery	Rochester-Flat Bridge	Steel	75 ft.	4	J. T. Raleigh Co.	10,53[illegible]
6-ABC	Grand-San Juan	Moab-LaSal Junction	Earth	23.25	90	Hyde & Black	372.42[illegible]
9-A	Millard	Delta-Holden	Gravel	10.61	96	Johnson, Gillespie & Adamson	114,04[illegible]
9-G	Millard	Holden-Kanosh	Gravel	5.14	98	Johnson & Badger	29,14[illegible]
9-H	Millard	Holden-Kanosh	Gravel	5.75	98	Mathews, Barrus & Wrathall	30,478.[illegible]
9-J	Millard	Holden-Kanosh	Gravel	7.80	98	Meadow Const. Co.	46,919.[illegible]
10-B	Uintah	Ft. Duchesne-Vernal	Gravel	3.19	30	A. G. Young & Co.	
10-C	Uintah	Ft. Duchesne-Vernal	Gravel	(1.31)	14	A. G. Young & Co.	69,596.1[illegible]
10-B	Uintah	Bridges for above	Wooden	4 Br.	38	Caldwell, Batty & Eaton	
12-A	Washington	Ash Creek-Anderson's	Gravel	7.30	90	McArthur, Winsor & Whitehead	90,873.5[illegible]
12-B	Washington	Bridges for above	Concrete	4 Br.	100	Snow, Cannon & Kemp	58,964.2[illegible]
17-A	Millard	Scipio-Juab	Gravel	7.08	75	Hawley, Anderson & Hinkley	48,288.1[illegible]
17-B	Juab	Chicken Creek, Millard Co.	Gravel	13.87	0	Hawley, Anderson & Hinkley	93,686.3[illegible]
17-C	Juab	Levan-Chicken Creek	Gravel	9.04	99	Paxton, Dorrity & Black	73,627.3[illegible]
31-A	Weber	Riverdale Overhead	Gravel	0.5	60	Union Construction Co.	43,072.3[illegible]
31-B	Weber	Bridge for above	Steel	144 ft.	30	J. J. Burke Co.	43,974.3[illegible]
33	Cache	Sardine Canyon	Gravel	6.96	67	Olaf Nelson	114,448.3[illegible]
39	Salt Lake	Magna-Tooele Co. line	Concrete	6.41	78	Moran Paving Co.	210,674.[illegible]
42-A	Wasatch	Heber-Hailstone	Gravel	7.46	54	Gilkerson Const. Co.	68,904.[illegible]
42-B	Wasatch	Hailstone bridge	Steel	63 ft.	99	Christensen, Jacob & Gardner	21,682.[illegible]
43	Sevier	Richfield South	Concrete	1.5	18	Gray & Murdock	62,569.[illegible]
46	Rich	Woodruff-Wyoming	Gravel	7.4	74	Kroft & Bundy	51,537.[illegible]
47-A	Sanpete	Moroni City	Concrete	1.0	97	Reynolds Ely Co.	39,237.[illegible]
47-B	Sanpete	Moroni-Fountain Green	Gravel	7.09	85	Reynolds Ely Co.	53,298.[illegible]
47-C	Sanpete	Fountain Green	Concrete	1.0	....	Reynolds Ely Co.	32,774.[illegible]
47-D	Sanpete	Fountain Green-Juab Co.	Gravel	5.33	33	Reynolds Ely Co.	45,064.[illegible]
49	Summit	Gogorza-Salt Lake Co.	Gravel	3.06	41	Moss, Snarr & Thyne	40,448.[illegible]
50	Utah	Payson-Juab Co.	Concrete	8.56	0	Wasatch Grading Co.	261,464.[illegible]
51-A	Tooele	Knolls-Wendover (Salt Sec.)	Earth	6.06	49	N. E. Lamus	66,120.0[illegible]
51-A	Tooele	Knolls-Wendover	Gravel	39.55	5	Kroft, Bundy, Zimmer & Lamus	280,000.0[illegible]
52	Sevier	Salina-Redmond	Concrete	1.50	40	Gray & Murdock	96,288.1[illegible]
53	Juab	Nephi City	Concrete	1.77	65	Wasatch Grading Co.	36,070.4[illegible]
54	Iron	Cedar-Kanarra	Gravel	12.01	0	J. T. Raleigh Co.	110,427.1[illegible]
58	Box Elder	Cache-Mantua	Gravel	4.14	0	Wheelwright Construction Co.	84,078.8[illegible]

Contracts Recently Awarded

F. A. P. No. 54.

Cedar City-Kanarra, 12.01 miles gravel surface, Iron county. The contract on the above road was let January 29 to the J. T. Raleigh company of Salt Lake. Weather conditions have prevented any work until recently. Mr. Raleigh plans to move his entire outfit on the job about March 15 from Castle Dale, where he is just completing a federal aid job between there and Ferron. Some work, however, on the drainage structures will start within the next few days. The construction of this project will be in charge of Resident Engineer B. S. Remington, for the state.

F. A. P. No. 58.

Cache-Mantua, 4.14 miles gravel surface, Box Elder county. The contract for the above construction was let January 29 to The Wheelwright Construction company of Ogden, Utah. Frost and snow conditions have prevented them starting work during February.

Projects for Which Plans Have Been Submitted

F. A. P. 24-C.

Price City Underpass and Price City paving, 1.125 miles concrete. February 19 a hearing was held before the public utilities commission of Utah at Price, to determine the division of costs and the necessity of the elimination of the present grade crossing. The above commission has promised an early decision in the matter. This will remove the last stumbling block in the path of the completion of this federal aid project.

F. A. P. No. 66.

Parowan-Winn Hollow, 9.6 miles gravel surface, Iron county.

Projects for Which Bids Are Advertised

F. A. P. 56 and 57.

April 8 is set for the opening of bids covering the construction of 11.3 miles of gravel between Redmond and Gunnison and 1.1 mile of concrete in Gunnison, both under one contract, which will also include construction of a 48-ft. bridge over the San Pitch river.

Plans in Course of Preparation

F. A. P. 19-B.

Junction-Red Bridge, 4.5 miles gravel surface, Piute county. The location survey of this project was recently completed. The line will extend south from the end of the present Marysvale-Junction federal aid project and will terminate at the Red Bridge (a federal aid structure built in 1920). The new location will eliminate several right angle turns and present a much better alignment than the present road. A joint review of this project will be made with the bureau engineers after which plans will be completed and presented for approval.

F. A. P. 19-D.

Red Bridge-Garfield county line. The survey of this road was also completed and it is hoped that this section may also be included in the 1924 program.

F. A. P. No. 55.

Black Ridge, 4.3 miles gravel surface, Washington county. This project is the subject of a special article in this issue.

F. A. P. No. 59.

Layton-Clearfield, 4.11 miles, Davis county. This proposed project consists of widening and resurfacing of a section of the old state standard 16 foot concrete road. Plans and estimates are 95% complete and call for the widening to 20 feet and resurfacing with concrete or bituminous concrete. As this is the first hard surface resurfacing job contemplated by the state, it is being looked forward to with much interest by both engineers and contractors.

F. A. P. No. 60-A.

Echo-Emery, 11.0 miles gravel surface, Summit county. Plans of the above project are now in the process of completion and will be forwarded to the bureau of public roads for review within the next two weeks. It was found necessary to make several additional field investigations in order to take into account the numerous topographic changes which resulted from the railroad construction in that vicinity and subsequent to our survey. Plans have been received for

nderpass structure near Echo and eing reviewed by the bureau of pub- ads.

P. No. 61-ABC.

ina - Aurora - Sigurd - Richfield 18.0 of gravel surface, Sevier county. ocation of this project was recently leted and the plans and specifica- are about thirty per cent complete. ts-of-way, plats and descriptions been furnished the county officials at the necessary easements can be ned before the project is advertised. federal funds for this project will be available until after January 30, . In the meantime all the necessary ils will be worked out so that actual truction can start at that time.

. P. No. 62-A.

evil's Gate-Weber, Davis county. The ey of this proposed project has been pleted and the plans are being pre- d. This project is included in the construction program.

A. P. No. 64.

arysvale-Sevier, 4.9 miles gravel sur- , Piute county. The location of the ve project was recently completed. present road is about 5.5 miles in th with grades as steep as 8 per . The new location eliminates many rp and dangerous curves, cuts down distance to 4.9 miles, and has a maxi- n grade of only 5.7 per cent.

A. P. No. 65.

rem-Wasatch county line in Provo yon, 9.5 miles gravel surface, Utah nty. Considerable agitation has de- oped regarding the routing of this d from Orem to Olmsted, instead of m Provo to the mouth of the canyon. is the contention of the Provo people t three-fourths the people using the yon road are coming to or going from ovo, so that the road via Orem would serve the bulk of the traffic as would connection directly into Provo. The mmission and the bureau of public ads have promised the local interests at this important project will be stud- from every angle before a decision reached as to which connection will considered.

A. P. No. 67.

Scipio-Holden, 12.0 miles gravel sur- e, Millard county. Plans and specifi- tions for this project are about fifty r cent complete. They will likely be mpleted within the next month and esented for federal approval.

Proposed New Work

A. P. No. 7.

LaSal Junction South 6.0 miles gravel rface, San Juan county. This proposed ad will be an extension of present Fed- al Aid Project No. 6, which extends uth from Moab to LaSal Junction, now der construction. It will be a standard foot gravel surfaced road. The nec- sary funds for the preliminary engi- ering have been set aside from the unty state road funds and the plans d estimates will be completed within e next few months. Federal funds for is construction will be obtained from e 1925 appropriation which will not available until after June 30, 1924. e commission is now working on a tative arrangement for raising funds meet the county's share, which will about ten thousand dollars of the al cost of approximately forty thou- nd dollars.

F. A. P. No. 63-ABC.

Corinne-Tremonton, 15.0 miles, Box Elder county. The preliminary survey of these projects was recently authorized, and is now being completed by K. C. Wright, resident engineer on the Sardine canyon project.

Sections "B" and "C" will be the structures spanning the Bear and Malad rivers respectively, the types for which have not yet been determined.

F. A. P. No. 68.

Dog Valley-Beaver, Millard county, 8. miles gravel. The location survey on this project has not started.

F. A. P. No. 69.

Wild Cat-Millard county line, 6. miles gravel surface, Beaver county. The preliminary survey for the above project was recently authorized by the county and a survey party under the direction of G. Lewis will commence work within the next few weeks. This road is an important link in the Zion National Park highway.

F. A. P. No. 70.

Nephi-Levan, 9.0 miles gravel, Juab county. The location survey was recently authorized and this work is now being completed under the direction of R. B. Patterson. This proposed project connects the concrete surface project, F. A. P. No. 53, in Nephi City, which is now under construction, with project No. 17 at Levan. This project will also be a part of the 1924 construction program.

F. A. P. No. 71-A.

Uintah river bridge, Uintah county, 100 feet steel truss. Authority was recently received for the preliminary work necessary for the construction of this bridge. A representative of this office will make a survey of the site within the next month, after which plans and specifications will be prepared.

F. A. P. No. 72.

Chester-Thistle, 45.0 miles gravel surface, Sanpete county. The Fairview-Mount Pleasant section of the above project was chosen as the first to be constructed at a recent meeting between the state road commission and the county officials. This will very likely be designated as section "A" and will be approximately six miles in length. The greater part of the preliminary engineering for this section has been completed so that a joint review with the federal engineers can be made in the near future.

WORK OF U. S. GEOLOGICAL SURVEY IN PAST YEAR

According to the annual report of the director of the fiscal year 1923, the work of the geological survey has covered effectively the broad field assigned to that organization, embracing geologic and topographic surveys, the study of mineral deposits, the collection of statistics of mineral production, the measurement of the flow of streams to determine the quantities of water available for use and to provide information needed for projects designed to prevent floods, the study of available ground water, and the classification of the public lands preliminary to the issue of patents or leases. More than 40 per cent of the United States has now been accurately mapped topographically, a large knowledge of its geologic features and mineral resources has been gained, and widely extended studies have been made to discover geologic processes, especially those that determine the accumulation of mineral deposits. Work has been continued in Alaska, surveys having been carried along the Alaska railroad and elsewhere, surveys of oil fields having been made, and the condition of the mining industry in the territory determined. The work of the geological survey has in the past been largely instrumental in promoting development in Alaska—The Highway Magazine.

"THE HOBO ENGINEER"

I sometimes think I'll quit this life
And settle down and get a wife, by Jove!
Sometimes I think that I would love
To have some place I could call home
And settle down, no more to roam.
But Hell, that very thing I've tried
And found myself dissatisfied.
I've often tried to settle down
To office work and live in town
And act like civilized folks do,
Take in the shows and dances, too,
But I'd no more than get a start
Till "Wanderlust" would seize my heart
And in my night dreams I would see
The great white silence calling me
And at the chance I'd never fail
To drop it all and hit the trail
Back to the solitudes again
With transit, level road, and chain
To lead the simple life once more again
And do the same thing o'er and o'er
Day after day and week after week,
Sometimes we go to town to seek
A little fun and sometimes—Well
Sometimes we raise a little hell.
We don't mean to, but then, you see,
When we've been out two months or three
In silent places where the face
Of white men seems so out of place.
Well—when we hit the "Great White Way"
Our joyful spirits get full sway—
We try to crowd into one night
The joys of many months, "'Tain't right?"
Well may be not, 'Tis not for me
To shape our final destiny
But when our last survey is done
And tied up to the Great Unknown
And to the Chief our records brought
Of lonely work with danger fraught
Of hardships cheerfully endured
That best results might be secured
Against all this our little sprees
Will seem as ponds compared with seas
And the Angels will decide
There's a balance on the credit side
And God, I think, will drop a tear
And bless the "Hobo Engineer."

—Author Unknown.

The husband, who had a great habit of teasing his wife, was out driving with her, when they met a farmer driving a span of mules. Just as they were about to pass the farmer's rig the mules turned their heads toward the auto and brayed vociferously.

Turning to his wife, the husband remarked: "Relatives of yours, I suppose?"

"Yes," said his wife, sweetly, "by marriage."—Chevrolet Review.

DRIVE BEGUN FOR ROAD FUNDS

Additional Mileage Near Zion Park Will Be Improved This Year.

At a meeting held in the office of Governor Mabey, March 11, road officials of the state and Washington county, together with representatives from the Salt Lake chamber of commerce, discussed the problem of getting immediate action on the improvement of roads in Washington county, and a plan adopted whereby the state's share of the cost of two federal aid projects near Zion Park, can be raised and contracts for their construction let this year.

The first of these proposed improvements is a portion of the main highway, extending from the north end of the Anderson's Ranch-Ash Creek project, now nearly complete, to the Iron county line and includes the difficult piece of location known as Black Ridge. The other section contemplated is on the branch road to the park, the improvement to begin at Anderson's Ranch and thence on a new alignment to Toquerville and La Verkin.

The depletion of Washington county's finances in the extensive improvements it has already made in the north and south highway, has reduced its funds available for new work to an amount sufficient only to carry to completion the necessary surveys and plans. The Black Ridge project will cost approximately $160,000, and the Anderson's Ranch-La Verkin about $60,000. The government will make available 74 per cent of the total costs of both, or $164,000. The balance, or $56,000, nearly all of which will have to be raised from other than county funds. Returns to the state from the Dixie Power company in connection with previous projects for highway improvement in Washington county will total $22,000. A few thousand dollars of county bond funds will probably be made available, but after exhausting these two sources of funds some $30,000 remains to be raised.

The plan adopted and under which funds are now being subscribed, is that all the committees along the Zion Park highway, from Salt Lake south, contribute to the improvement, the amounts to be underwritten by citizens of the various counties, are as follows: Salt Lake county, $10,000; Utah county, $5,000; Juab, Millard, Beaver and Iron counties, $2,500 each, and Washington county, $5,000.

Under this plan it contemplated underwriting of $30,000, to be borrowed from banks in the several counties, on notes given by the state parks committee in denominations of $1,000 each, and bearing interest at 6%.

It is understood by the underwriters that at the next session of the legislature it will be recommended by the governor and state board of examiners that an appropriation be made concerning the $30,000, to be underwritten in the event of its failure to do so, the endorsers will be called upon to pay the notes and interest.

Final Audit of Six Federal Aid Proj

After a project has been completed and accepted, the detours gone but gotten and the incident closed, from the standpoint of the public, the trouble accounting department of the road commission are by no means ended as evi the following tabulations which show the final costs on six federal aid pr Three of these projects were completed in 1922, but on all of them outstandi and the adjustment of various claims have delayed the closing of accoun recently.

Analysis of the costs of the various projects shows that 9.5 miles of surface road were constructed at a total cost of $69,376.53 or $7,302 per m that 29.29 miles of concrete road cost $863,788.71, an average of $29,940 per

Engineering charges on the gravel surface project amount to $7,830.76, per cent of the total cost, on the concrete jobs the total engineering is $42 or 4.92 per cent of the total. For all six projects the total costs are $97 with engineering and inspection $55,583.43, or 5.67 per cent.

Under receipts, the amount paid in each case by the federal government sents the total allowed on final vouchers for claims presented by the state fo materials and construction engineering. The government in no case particip the cost of preliminary engineering, which includes the cost of survey and the ration of plans and estimates. All of these projects are on the basis of 74% participation, the final figures showing that the government paid 66.24 per the total costs and the counties 33.76 per cent.

The statements show in each case an overpayment from the county and w closing of the accounts on these projects, these surplus funds have been cred the road fund of the several counties.

The statements are as follows:

STATEMENT OF RECEIPTS AND DISBURSEMENTS

F. A. P. No. 15, Buckhorn Flat, 9.5 miles gravel surface, Iron county.

Receipts

Received from Iron county	$ 19,300.00	
Received from government	50,608.42	
Total received on project		$ 69,9

Disbursements

Paid contractor, labor	$ 54,580.19	
Paid state forces, labor	2,272.76	
Cost of materials	4,692.82	
Engineering and inspection	6,207.31	
Preliminary engineering	1,623.45	
Total cost of project		$ 69,3
Cash on hand due Iron county		$

F. A. P. No. 25, Nephi-Utah county line, 15.53 miles concrete, Juab county

Receipts

Received from Juab county	$128,648.20	
Received from government	340,986.09	
Total received on project		$469,

Disbursements

Paid contractor, labor	$295,959.46	
Cost of materials	152,881.65	
Construction engineering and inspection	11,950.92	
Preliminary engineering	4,670.04	
Total cost of project		$465,
Cash on hand due Juab county		$ 4,1

F. A. P. 27, Smithfield-Cross Roads, 6.65 miles concrete, Cache county.

Receipts

Received from Cache county	$ 63,288.09	
Received from government	141,270.61	
Total received on project		$204,5

Disbursements

Paid contractor, labor	$107,757.56	
Cost of materials	75,248.35	
Construction engineering and inspection	7,900.33	
Preliminary engineering	2,616.93	
Total cost of project		$193,5
Cash on hand due Cache county		$ 11,0

F. A. P. 34-B, Payson-Spanish Fork, 5.74 miles concrete, Utah county

Receipts

ived from Utah county	$ 98,479.71	
ived from government	66,423.48	
Total received on project		$164,903.19

Disbursements

l contractor, labor	$ 91,499.85	
t of materials	60,243.25	
struction engineering and inspection	7,832.29	
liminary engineering	3,032.51	
Total cost of project	$162,607.90	
Cost of material turned over to the county—		
9 square yards wire mesh $379.05		
feet 15-inch C. M. pipe 32.50	411.55	
Total disbursements		$163,019.45
Cash on hand due Utah county		$ 1,883.74

F. A. P. No. 37, Springville City, 1.37 miles concrete, Utah county.

Receipts

ceived from Utah county	$ 11,388.29	
ceived from Springville City	1,605.61	
ceived from government	29,067.34	
Total received on project		$ 42,061.24

Disbursements

id contractor, labor	$ 22,612.21	
st of materials	14,636.00	
nstruction, engineering and inspection	2,031.98	
eliminary engineering	2,444.32	
Total cost of project	$ 41,724.51	
Returned to suspense account—		
oney due state from county	59.51	$ 41,784.02
Cash on hand due Utah county		$ 277.22

. A. P. 30-B, 63-ft. steel truss bridge and 46-ft. concrete girder bridge, Weber county.

Receipts

eceived from Weber county	$ 27,699.41	
eceived from government	20,815.93	
Total received on project		$ 48,515.34

Disbursements

aid contractor, labor	$ 33,159.78	
ost of materials	8,365.28	
onstruction engineering and inspection	2,224.62	
reliminary engineering	3,048.73	
Total cost of project		$ 46,798.41
Cash on hand due Weber county		$ 1,716.93

YES, IT'S QUITE A JOB

About $1,250,000,000 all told for federal, state, county, district, township and city highway construction and maintenance was expended last year in the United States. The federal and state appropriations for state highways alone totaled $800,000,000, the city and town appropriations for streets and roads totaled $285,000,000 and the remainder represents the funds expended by the counties, parishes, road districts and townships.

Compared with the 1923 road construction in the United States, the construction of the great Roman highways, the erection of the pyramids, the building of the Chinese wall and the excavation of the Panama canal pale into insignificance. The 1923 gain over 1922 was approximately $125,000,000.—The Highway Magazine.

3,000,000 AMERICANS ISOLATED

In the mountains between Pennsylvania and Georgia are pocketed 3,000,000 old line Americans who illustrate the social effects of isolation as vividly as Albania or the Caucasus. For this is the manner of settlement. The mountains come down to a point like the letter V. Adown this crease brawls a pretty river; leading into this from a smaller valley will be a creek; into the creek a "branch" and into the "branch" a "fork."

Each settlement is a "shoestring" along one of these water courses and constitutes a world within itself, for it is isolated from its neighbors by one or two thousand feet of steep, wooded ridge. The only wagon trails lie in the bed of a stream, which you may have to ford twenty times in a mile. Made roads there is none.—Salt Lake Telegram.

ROADS OF ROMAN EMPIRE 2000 YEARS OLD

The Roman empire was intersected by roads constructed principally between the second and fourth centuries after Christ, says Adventure. These highways varied in width from eight to fifteen feet, and were almost universally built in straight lines without regard to grade, probably because the use of beasts of burden as the chief means of transport made the preservation of the level an affair of minor importance. Soldiers, slaves and criminals were employed in the construction of these highways, the durability of which is shown by the fact that in some cases they have sustained the traffic of 2000 years without material injury.

The Roman forum is said to have been the point of convergence of twenty-four roads, which, with branches, had a total length of 52,904 Roman miles. The Romans are said to have learned the art of road building from the Carthaginians.

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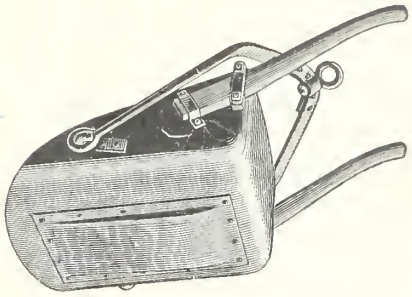
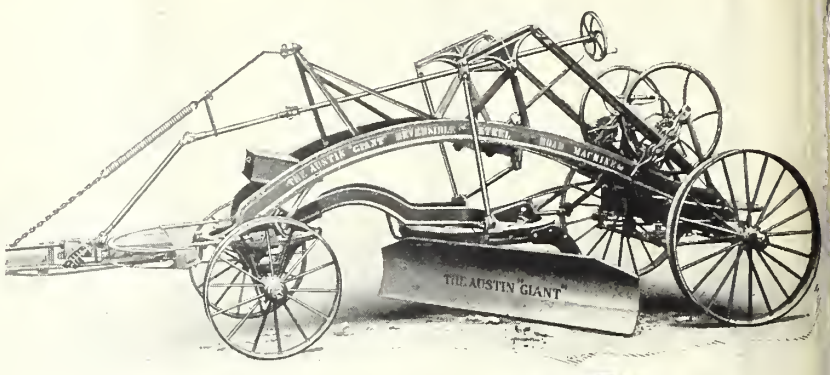
Road Building Equipment
Was. 8973 Salt Lake City

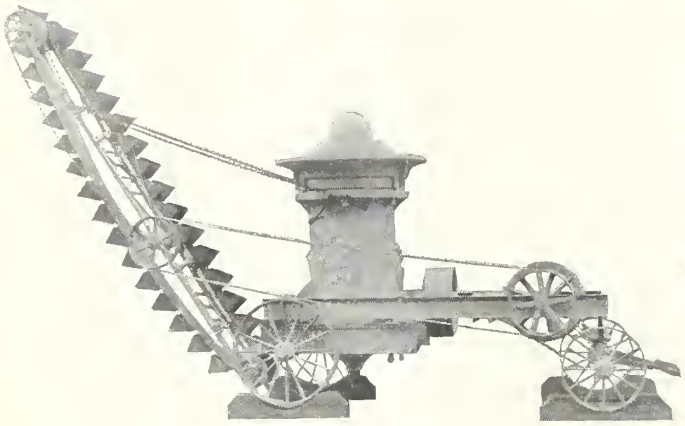
Inland Engineering & Construction Co.
GENERAL CONTRACTORS
Kiesel Bldg. Ogden, Utah
Phone 307

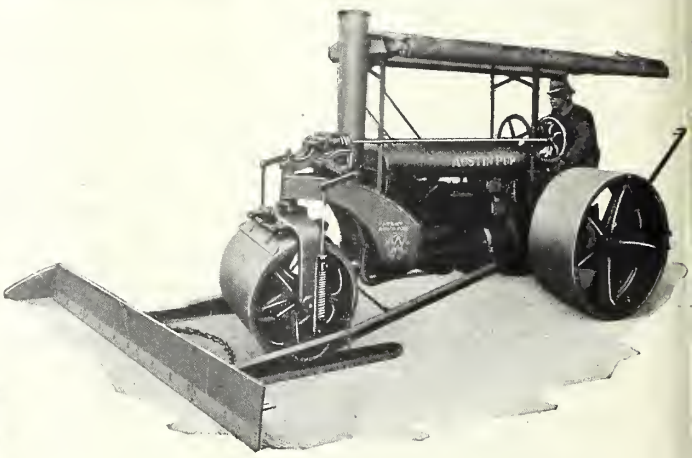
KROFT & BUNDY
GENERAL CONTRACTORS
Road and Bridge Work a Specialty
General Contractors
Knolls-Wendover Highway
OFFICES
218 Kiesel Bldg., Ogden, Utah
Phone 972

The Leading Line of Earth Handling Machinery









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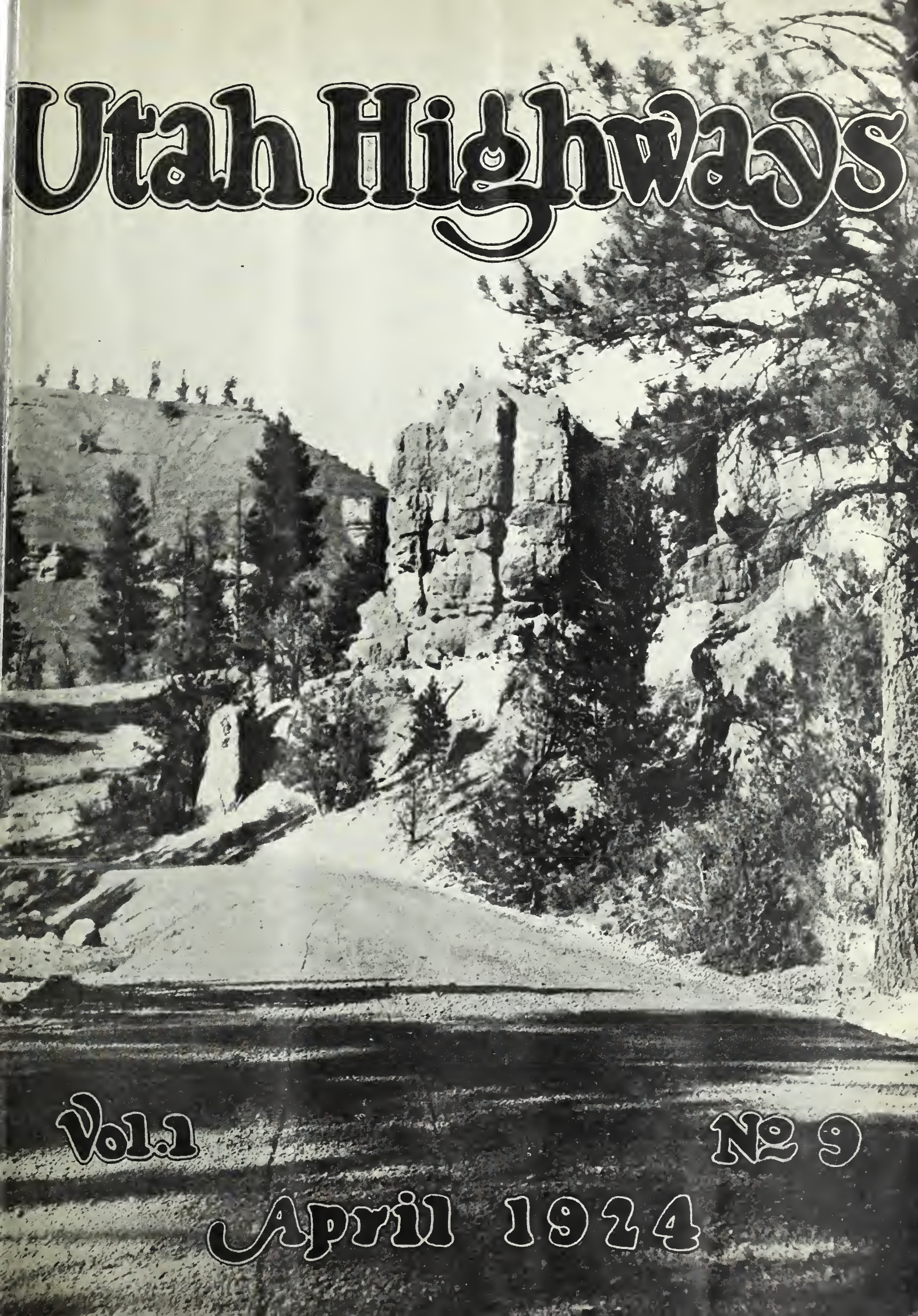
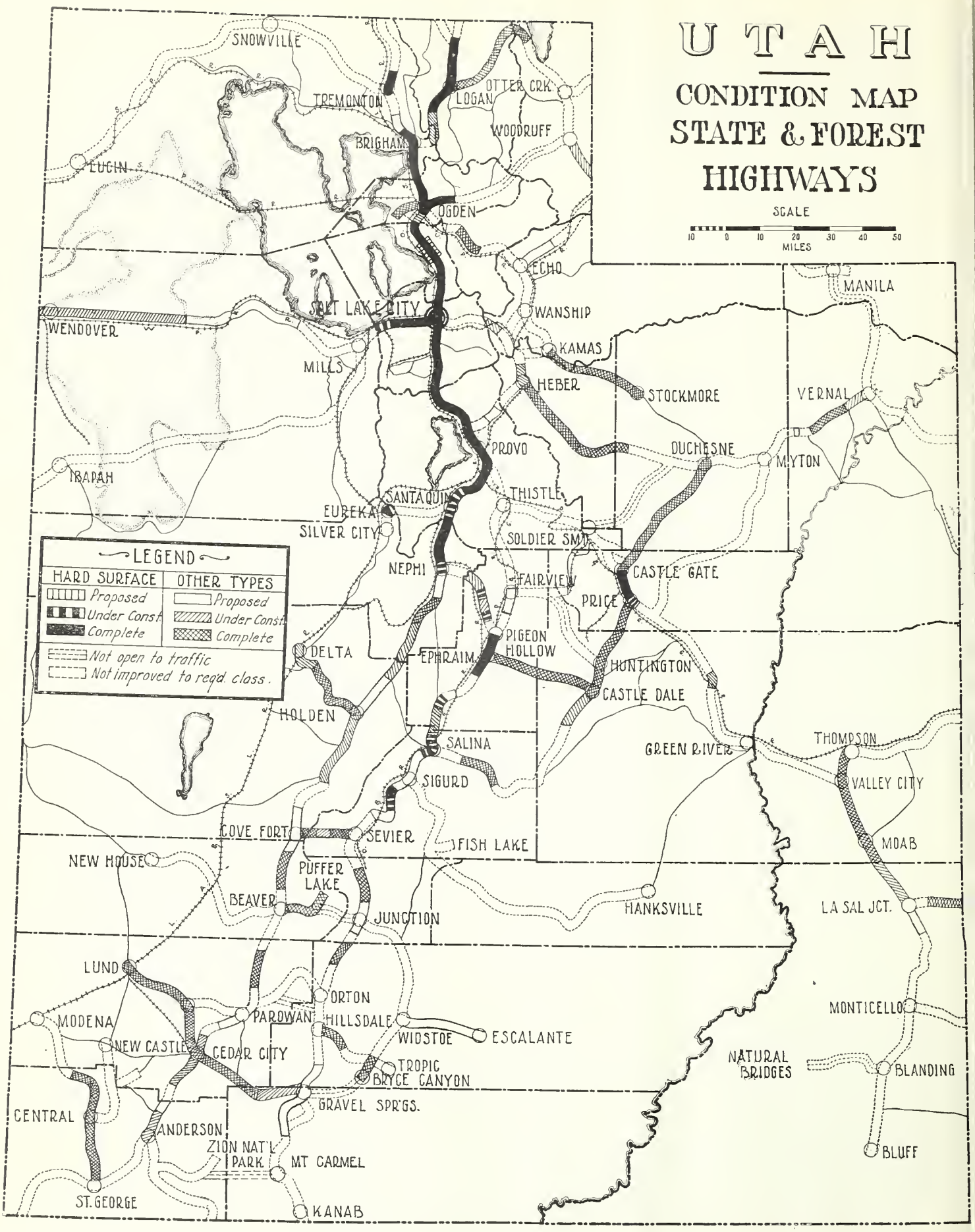


Vol. 1 No 9

April 1924


UTAH
CONDITION MAP
STATE & FOREST
HIGHWAYS
SCALE
10 0 10 20 30 40 50
MILES
LEGEND
HARD SURFACE
Proposed
Under Const.
Complete
OTHER TYPES
Proposed
Under Const.
Complete
Not open to traffic
Not improved to req'd. class.
SNOWVILLE
TREMONTON
OTTER CRK.
LOGAN
WOODRUFF
BRIGHAM
LUGIN
OGDEN
ECHO
MANILA
SALT LAKE CITY
WANSHIP
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GREEN RIVER
THOMPSON
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NEW HOUSE
PUFFER LAKE
BEAVER
JUNCTION
HANKSVILLE
LA SAL JCT.
LUND
ORTON
MONTICELLO
MODENA
PAROWAN
HILLSDALE
WIDSTOE
ESCALANTE
NEW CASTLE
CEDAR CITY
TROPIC
BRYCE CANYON
NATURAL BRIDGES
BLANDING
GRAVEL SPR'GS.
CENTRAL
ANDERSON
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KANAB

Utah Highways

OLUME 1. APRIL, 1924 NUMBER 9

Sixty Miles of Highway Improvement in Southeastern Utah Nearing Completion

Back in the days when Utah was arning the ins and outs, the provisos id exceptions which attached to and ere a part of federal assistance in highay improvement, a project was initiated r the improvement of sixty miles of ad leading from Thompson on the rice-Grand Junction highway, south rough Grand county to La Sal Junon in San Juan county. Here a branch tends east across the state line to Duango in Colorado and the road south ontinues a fair highway, though far om present standards for automobile affic to Monticello, and beyond to the il fields.

With approval given for the proposed onstruction, surveys were made, plans rawn, and the work finally let as federal id projects Five and Six in October, 919, under four contracts. Originally pproved as a 12-foot roadway, but little vork had been done before the plans vere changed making it a 24-foot roadway and it is to this width that the road now nearing completion has been built. It is a fine road, one of the best in the state, and truck and auto service into the heart of an extensive and growing farming and live stock region, wholly devoid of railroad transportation, is rendered quick and easy. The numerous changes and improvements introduced as the work progressed and the financial difficulties which have arisen have greatly delayed completion and the projects have been closed down at times for months, once for more than a year. The plans called originally for no surfacing, it having been the intention to construct a graded earth road throughout but as the work advanced and various sections were thrown open to traffic the advisability of gravel or shale surfacing over considerable stretches was seen and on some locations, notably Section C of project six a clay topping was found to be necessary. Of the sixty miles eighteen have received special surface treatment. Another item which has been subject to much change and which has added greatly to the cost is that of bridges and culverts. Much of the topography the route traverses is very rough with an excessive run-off during the period of summer floods. Proposed culverts have been changed to bridges and bridges have grown to longer spans in the effort to furnish sufficient waterway for the flash floods of mid-summer. A type of structure which has proved its serviceability is the spillway or "submerged" type of bridge, where the highway crosses on the floor of the dry wash but is heavily encased in concrete to withstand the floods which occasionally sweep over it. From all of these causes the projects have enormously outgrown the estimated costs of the original agreement and will cost, complete, approximately $800,000, or an average of $13,000 per mile, including the cost of all structures.

Project Five, 37 miles long, has been completed and accepted by the state and the federal bureau. Project Six is complete except for the application of some surfacing and the finishing of the bridge at Little Mud Shoe. Lewis R. Fife, for the state, is completing this project, the contractor having withdrawn.

Further improvement of the road toward Monticello, the first six or seven miles south of La Sal Junction, is planned for this summer as federal aid project seven. The grading and surfacing of this portion of the road will greatly reduce the cost of haul to and from Monticello, the stretches of deep sand which it includes necessitating lighter loads than elsewhere on the route.

The improvement of these projects is timely aside from assisting in the upbuilding of the agricultural wealth of a new country, in that it retains for Utah the advantage to be derived from the de-

F. A. P. 6, San Juan Co.—Typical culvert construction; gravel loading plant, Sec. B; and submerged bridge at Pack creek crossing

Rainbow Natural Bridge, San Juan County

velopment of the oil fields in southern San Juan county and which otherwise would be of commercial importance chiefly to Arizona.

Another road which will doubtless soon follow from this parent system will serve to develop the San Juan national forest and furnish an automobile route to the great natural bridges. There are seven of these natural bridges in Utah that are quite without a peer elsewhere in the country and six of these are in San Juan county. Possibly there are others yet to be found, several of those in San Juan occupy about the wildest and most inaccessible region in the United States and one which has been only partially explored. It was only thirty years ago that the first white man gazed upon any of the bridges in southeastern Utah and none can yet be reached except by horseback and with competent guides to direct the party, for the bridges are not easily found. There are two national monuments set aside for these bridges in Utah. One, the Rainbow National Bridge monument, is south of the Colorado river and near the state line. This has only the one bridge, the Rainbow, or Na-gee-lid Non-ne-ze-shi, signifying from Navajo mythology, "the rainbow turned to stone." It is practically to reach this collosal structure, at present, only from the south. The other monument has three bridges and can be reached by horseback from Blanding, the trail leading through the La Sal national forest, the bridges being distant about forty miles from the main highway at Blanding.

Near Moab are to be found fine examples of ancient picture writing or hieroglyphics at no great distance from the highway and the entire region between the Blue mountains and the Colorado river is noteworthy for these hieroglyphics. This region was once thickly populated by the cliff dwellers and the remains of their dwellings occupy innumerable clefts and caves, many of which have never been entered and explored by white men and some are quite inaccessible, these ancient poples sometimes preferring to have as a means of ingress to their habitations only a toe hold here and there cut into the sheer face of the cliff.

Improvement of St. George Arizona Road Under Consideration

By H. S. KERR, Assistant Chief Engineer

Preliminary investigation looking to the improvement of the southern-most portion of the Zion Park highway in Utah, the section between St. George and the Arizona line, is in progress and it is the desire of the road commission to find ways and means, if possible, to complete this Washington county road simultaneously with the other portions of the interstate highway which are scheduled for early improvement.

While much work has been done, and a marked improvement noted, particularly during the past three years in the reconstruction of this important through route lack of available funds has seriously handicapped the commission and the amount of work accomplished each year has been much less than it desired. The state and the various counties interested are doing all that is possible to speed up work on those sections where reconstruction is most urgently desired, elsewhere in this issue being noted the drive for funds to place under federal aid two projects in Washington county north of St. George. It most unfortunately happens that this, the county on the route having the least population and the lowest assessed valuation, with practically no corporate wealth, is the one that leads, both as to mileage and also in the cost per mile for subgrade and structures. The potential wealth of this county is, however, considerable, and one of the greatest factors in developing it will be the construction of first-class highways. One of its chief assets is the warm climate throughout the winter months of the lower valleys, St. George, the county seat, having an elevation fifteen hundred feet lower than any other portion of the state, outside of Washington county. Upon the completion of a good highway from Salt Lake through to St. George undoubtedly greatly increased numbers will visit this region not only to enjoy the wonderful climate but to see nearby Zion park, the canyon of the Virgin river and other points of interest.

The rough topography of Washington county renders the grading cost of road work excessively high. One federal aid project is nearly completed, another about ready for advertising and a third project is now under survey. The average cost for the three projects for the completed 24-foot roadway with 18 feet of gravel surface will be close to $20,000 per mile.

With the work now under way we will soon have a first-class highway, open throughout the year, between Salt Lake and St. George and as soon as the necessary funds can be had the work of improvement will be pushed beyond St. George to the Arizona line; the construction of this portion is made imperative on account of the rapidly growing traffic to and from southern California.

Transcontinental Highway to Be Finished

BY HOWARD C. MEANS Chief Engineer

The annual meeting of the Overland ail club, an organization formed in Ne-da to advance the construction of the rthern route through that state, was ld in Winnemucca this year on March and 22.

Utah was represented by Governor arles R. Mabey, Chairman Preston G. terson and Chief Engineer Howard C. eans of the state road commission, to-ther with F. C. Schramm, representing lt Lake Rotary club; Charles Tyng, presenting Salt Lake chamber of com-erce; W. D. Rishel of the Utah Auto-obile association, and John E. Jones, presenting the Kiwanis club of Salt ake.

The meeting was attended by county mmissioners and road men throughout evada and was a very enthusiastic eeting from the start. W. H. Good-in of Lovelock, president of the Over-nd club, is a very enthusiastic road oster for the Victory highway from alt Lake through the Humboldt valley Nevada to San Francisco. Mr. Good-in injects the right kind of enthusiasm nd has done inestimable service in oosting the construction of this road.

At a meeting held a year ago in Elko, rrangements were completed for the irst $50,000 raised by the Utah-Nevada-alifornia Highway association in Cali-ornia, and was to be used by Utah in ts construction of the Wendover link of his highway, on which work is now well dvanced. At the Winnemucca meeting his year, another very good stroke was ccomplished in California agreeing to nake available, at once, another $50,000 or Nevada's construction.

Nevada has its problems in completing he links of this 432 miles of highway rom Wendover to the California line vest of Reno. At this meeting it de-veloped that the total mileage of this ntire distance was either built or fi-nanced excepting three small links ex-sting in Eureka, Lander and Churchill ounties. Arrangements were made vhereby the Eureka and Lander county ommissioners were prevailed upon to nake a small amount of money available or the construction in their respective ounties, this amount to be increased up o the state's participation by California unds from the $50,000 so that it was hought these two links were pretty well dvanced in plans for financing.

Another matter was the line change in Churchill county that was being dis-ussed. At the Winnemucca meeting ar-angements were completed for a meet-ng between the highway commission of Nevada and the county commissioners of Churchill county at Fallon, the following veek, where it is believed this problem has been definitely settled. The section between Moor and Silver Zone Pass, 30 miles in length, on the Wells to Wen-dover link, will be under construction this year. The 21 miles from Silver Zone Pass to Wendover is programed for onstruction during 1925 and inasmuch as the stretch from Moor to Wells, cov-ering 10 miles, is in fair shape at the present time, it is thought this entire gap in an improved highway between Salt Lake and San Francisco will be closed up within the next two years.

The Wendover construction in Utah is progressing very satisfactorily. Work on the six-mile Salt Section in the vicin-ity of Salduro has been continuous during the winter, and the trencher has about completed the placing of material for the fill. Work on the remainder of this 40 mile stretch is being carried on at the present time. Three subcontracts have been let representing something like 15 miles of this stretch. Another subcontractor will be placed west of Barro who will undertake about 4 miles additional. This will leave the section of road where bad mud condition exists for trencher construction. At the pres-ent the trencher is just starting in the vicinity of Arinosa and will work east to connect with the portion under sub-contract. The delivery of gravel by the Western Pacific railroad will commence shortly after May 1, which is thought to be in ample time to fit in with subgrade construction. From Wendover east two miles to the beginning of the mud flats the grading is complete and gravel sur-facing has been placed from a local pit. The present progress of the work is very satisfactory, as ordinarily construction would not start until about April 1, and it is believed the work accomplished dur-ing the winter months makes it possible for this entire contract covering the 40 miles between Wendover and Knolls to be completed and open for travel the first part of September.

Washington County Road Funds Being Raised

As stated in our last issue expensive highway improvements in southern Utah have nearly exhausted the available road fund of Washington county and in order to finance the Black Ridge and the An-derson's Ranch-LaVerkin federal aid projects had become necessary to resort to public subscription to obtain $30,000.00 of the $56,000.00 required as the state's share of costs. The combined cost of the two projects will be $220,000.00, of which the federal bureau will furnish 74% when local funds have been made available. The amounts which commit-tees in the several counties along the Zion Park highway from Salt Lake south undertook to raise are as follows:

Salt Lake county, $10,000; Utah coun-ty, $5,000.00; Juab, Millard, Beaver, and Iron counties, $2,500.00 each, and Wash-ington county, $5,000.00.

Reports at hand show that nearly all the funds required have been raised, Provo will underwrite $3,000 of Utah county's share, in Salt Lake $1,000 was subscribed at once by the chamber of commerce and a committee of three ap-pointed to collect the balance of Salt Lake county's share. In Fillmore Bea-ver county's quota was raised in less than 20 minutes. Equally ready re-sponses were met with in Cedar City, Parowan and St. George. Randall L. Jones and F. B. D. Gay as members of the campaign committee give assurance of the success of the drive.

Machinery Shown Under Working Conditions

The first open air demonstration of road building methods and machinery will take place in North Carolina, June 4, 5, 6, and 7. The American Road Build-ers' association has accepted the invita-tion of the North Carolina state high-way commission to hold such a demon-stration or "shirt sleeve road show" as it has been christened by Frank Page, president of the American Road Build-ers' association.

The Pan-American Highway commis-sion, consisting of a group of about forty leaders in the highway movement in the various countries of South and Central America, will be in North Carolina at that time. These distinguished visitors will visit the shirt sleeve show, and the American Road Builders' association ac-cepted the invitation of the North Caro-lina state highway commission in order that it might do its full share to assist the members of the Pan-American High-way commission in their study of high-way conditions in the United States.

Hitherto, all exhibits of road building machinery in the United States have been held indoors where it was impossi-ble to put the machinery actually at work. For this reason the North Caro-lina show will be of unusual interest. The Pan-American Highway commission, as well as engineers from other foreign countries who may be in the United States at that time, will have an oppor-tunity to see the latest types of ma-chinery in operation under ordinary working conditions.

Since its organization, more than 20 years ago, the American Road Builders' association has been in the forefront of the nation's great movement for more and better roads. For a great many years, it has conducted during the winter its annual convention and national good roads show which have become known wherever road construction is discussed. The decision to hold a shirt sleeve show in North Carolina this spring is another forward step. C. M. Upham, business manager of the American Road Builders' association, will be in active charge.

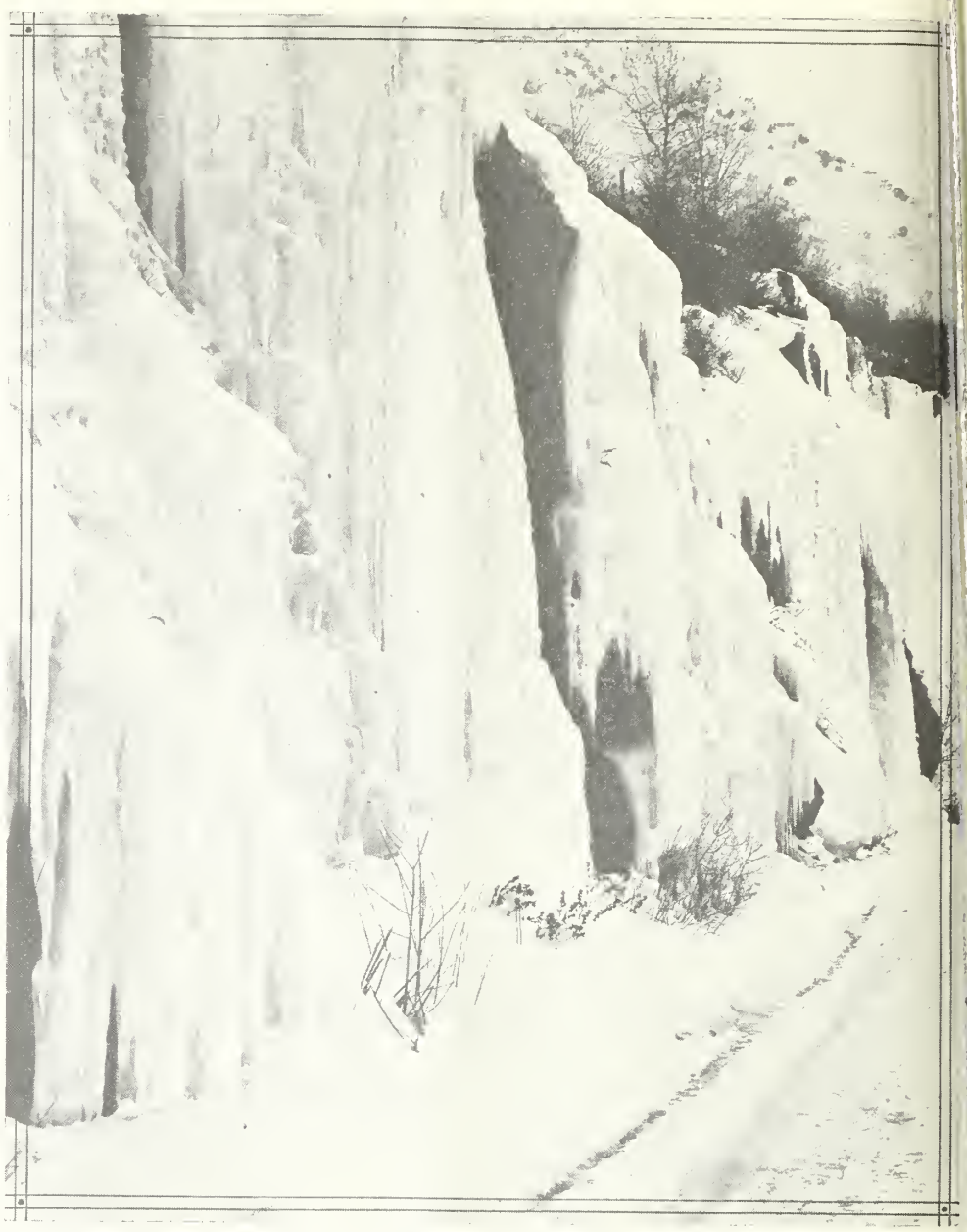
North Carolina has been selected as the scene of this open air demonstration not only because of the fact that it ex-tended an invitation to the American Road Builders' association, but also be-cause it is well recognized as one of the most progressive road building states in the United States at the present time. It also largely by reason of its situation and topography is developing roads of varying types. For that reason, it was chosen by the highway education board as the state to which the distinguished visitors will be taken at the outset of their trip.

Keeping Country's Highway Open in Winte

Very encouraging results were obtained last winter in the effort to keep open to traffic an extensive mileage of the state roads. Great assistance was rendered doubtless in an abnormally light fall of snow but never before since the inception of the Good Roads movement has such a state-wide concerted effort been made to keep the roads clear for winter traffic. On a number of mountain passes successive snow-falls were cleared from the highway and roads that heretofore have been closed several months out of the year, were kept open during the entire winter. Improvements with federal aid, at first in widely separated districts, have progressed to a point where the projects now under construction are linking together an extended mileage of highly improved road, this is particularly true on the Zion Park highway, where projects now under way will complete a connected mileage from a point near the Idaho line in Cache county to well within the southern part of the state, with hard surfaced types over the greater portion of the distance. Not only will there be a growing demand for all-year use of such roads, but the removal of snow from the surface, from the standpoint of protection of the investment, is important as greatly lessening the damage liable to result from saturation of the subgrade from melting snow.

In the survey of projects for improvement every advantage is taken to locate the permanent highway, so as to minimize so far as practicable expensive snow removal, a case in point being the construction of the cut-off in Price canyon by state forces, where aside from the saving of nine miles of distance between Colton and Price, the new route will eliminate entirely the deep and drifting snow heretofore encountered through Emma Park.

The rapidly increasing mileage of improved interstate roads under the federal aid program is necessitating a great deal of attention to snow removal throughout the country and the following excerpt from a bulletin issued by the department of agriculture, gives a survey of the progress that is being made:



Winter scene in Big Cottonwood Canyon, Salt Lake county

Removal of snow from the highways of the country is a matter of increasing importance each winter. Since 1906, the number of motor vehicles registered has increased from 48,000 to over fifteen million while the mileage of surfaced roads has increased from 150,000 miles to about 430,000 miles. Approximately 62 per cent of the motor vehicles are registered and 53 per cent of the surfaced roads lie within the territory where the average annual snowfall is 20 or more inches.

The snow clearing program of the states east of the Mississippi for the present winter includes 16,000 miles of main trunk line highway as compared with 13,000 miles for last winter, according to information collected by the bureau. This amounts to about 30 per cent of the surfaced mileage in the states where snow is a problem, those north of the southern boundary of Virginia and Kentucky.

With the exception of a few small areas the annual snowfall in this belt ranges from 20 to 130 inches, making the clearing of the above mileage an undertaking of considerable size. As indicating the size of the undertaking in various sections, the average annual sonwfall ranges from 74 to 132 inches in Maine, from 25 to 92 inches in Pennsylvania, from 16 to 22 inches in Delaware, from 28 to 121 inches in Michigan and from 9 to 101 inches in West Virginia. The above figures taken from weather bureau records covering a period of years show that the problem of snow removal varies considerably in difficulty even in different parts of the same state. In nearly every state in the group the average maximum snowfall is more than twise as great as the average minimum snowfall, Delaware being the only conspicuous exception.

Snow is removed by state forces in Rhode Island, Connecticut, New Jersey, Pennsylvania, Maryland, Delaware, Virginia, Ohio, West Virginia, Illinois, and Indiana and on one section of road in Minnesota. The work is left to counties, towns or other local units in New Hampshire, Vermont, Massachusetts, New York, Kentucky, Michigan, Wisconsin, and the greater part of Minnesota. In Michigan and Wisconsin the counties may be ordered by the state highway department to remove snow from state roads.

Pennsylvania, one of the pioneers in snow removal, may be taken as having an organization typical of those well organized for the work. The work is done by the state highway department with its regular maintenance forces and funds, the funds being derived from motor vehicle registration fees. The state is divided into four divisions which are subdivided into 15 districts. Under the district engineers are 52 superintendents, 700 foremen, 6300 laborers, 130 truck drivers, and 40 tractor operators.

"You Have to Move Dirt to Build a Road"

I would like to recommend that every locator, in fact every one of us, put this slogan in a place where it often will be called to his attention. It sounds, perhaps, like a creditable motto for the construction department to adopt; but, it is even more important, that those of us who are connected with surveys and plans continually bear in mind its import.

We work away at our particular duty, accomplish a very creditable location, turn out a wonderfully neat plan, design a complicated structure, work out and solve some trying problem; and, soon, our particular duty becomes the important operation to us. We forget our work is only to the end that the road may be built.

A highway commission does not exist for the purpose of making fine surveys and beautiful maps, but to build roads.

Location Fundamental

This is not to be construed as detracting from the importance of the work involved in our department, for we always have the comfort of knowing that the most important, fundamental and permanent feature of any road is the location. It probably means more than comfort; it means pride to know that we have accomplished a difficult location, satisfying all the requirements good locations should satisfy; the demands of traffic, not only of the present but the future as well, the greatest possibilities for development of the country, safe and easy alignment, reasonable grades, adequate drainage, proper exposure, shortest length and lowest cost.

Because location is the permanent feature, it must be done well, and the more so, when we realize it is to be made more permanent by actual construction.

It is not possible, nor within the scope of this article, to deal with all the details which necessarily must be considered in this work. However, a few principles of good location may be set down for general guidance.

Good Location Principles

Drainage, soil and climatic conditions influence and control location. It is desirable that unnecessary stream crossings flooded areas, slides, swamps, excessive rock excavation and snow be avoided.

The expenditure of any money, necessary to provide alignment and grades satisfying all requirements, is warranted.

Safety of traffic should be the principal guide in the adoption of alignment. Poor or dangerous alignment should not be used to hold grades below the adopted maximum; rather, good alignment with a higher rate of grade is better than poor alignment and a lower rate.

Where rolling grade can be adopted, as in fairly flat or rolling country, longer tangents and easy curves are desirable. By fitting the grade to conform to the undulations, excavation quantities can be held down.

A rolling grade is economical, satisfactory, pleasing in appearance and not objectionable to traffic. Long straight grades, which probably are a result of railroad training, have no advantage over the rolling grades; in fact, are less desirable in easy country.

Exceptional Occasions

There are exceptional occasions when increased distance is warranted; when, by the use of improved alignment, danger to traffic is eliminated, or when it is necessary to obtain a reasonable maximum grade. The saving in yardage, by increasing distance to escape heavy work, is usually offset by the increased cost of future surfacing and operation.

Introduction of adverse grades is permissible to eliminate dangerous alignment, but its use to shorten distance is only warranted when the advantage of such shorter distance over the extra rise is definitely apparent.

In mountainous country, where most of the location is along side hill, excessive grade does not effect saving over a more reasonable rate. A five per cent grade hardly will involve more yardage than an eight per cent on side hill construction.

The use of short stretches of higher rate than the adopted ruling grade often is advantageous. Where a five per cent grade has been adopted, as the ruling grade, it may be economical to use short lengths of six or seven per cent. For instance: When the line is running up a valley with easy slopes on an easy grade and must leave the bottom land, climb a sie hill and cross a saddle, it usually is better to make the climb quickly; that is, use a steeer grade, because side hill alignment is usually poorer and its construction more expensive than valley location.

Curves and Tangents

In general, simple or compound curves are to be preferred to two curves in the same direction connected by a short tangent. The use of the simple or compound curve results in longer radius and greater sight distance, is easier to drive, makes superelevation uniform and continuous and simplifies construction.

Tangents between reverse curves are desirable but should not be insisted upon in difficult location where increased cost will result.

We are continually encountering locations where peculiar and exceptional conditions exist; where accepted rules or principles will not uniformly apply. Our reputations as locators are established by our treatment of such cases.

It is the location that follows most closely these accepted principles, on which, after careful office study, a minimum of change is required. Too often the office study reveals opportunities for improvement and economy. In the final analysis, however, it is only on the ground that the real and final adjustments can be made with true economy. Nevertheless, office studies are necessary, for it is here that the full details of the road design are developed and the final polish given to the work.

Plans Final Product

The plans are the final product of all this industry. It seems only reasonable they should show complete and necessary information pertaining to the work to be done. There is no better place than in the plans to record all the data that have been so laboriously gathered and evolved.

It serves a multiple purpose; it furnishes the resident engineer with the notes and data concerning the line and grade, the ideas of the designer relative to section, drainage and structures; it acquaints the contractor with the nature and character of the work, the quantities involved, and the desired result; and it becomes a record for the future.

A skimpy plan means incomplete engineering study or a lack of appreciation of its importance.

So the necessity becomes evident of ordering and planning our work to the end that the completed plans will not only reflect the labor and study involved but will insure the final result: a well built road located on a standard satisfying all the demands of traffic, today and tomorrow.—California Highways.

Wages of Highway Labor Reported

Statistics compiled by the bureau of public roads of the United States department of agriculture show the average hourly wages of highway labor during February in the nine geographic divisions into which the states have been grouped. Below is given the figure representing the highest and lowest averages for all groups. The figures are based on reports on federal aid projects only, and since February is not a month of heavy construction they do not represent a large number of workers.

	High Group Average	Low Group Average
Superintendents	$1.23	$0.96
Foremen	1.00	0.55
Truck drivers	0.65	0.26
Mixer operators	0.84	0.33
Steam shovel operators	1.15	0.57
Carpenters	1.10	0.43
Concrete finishers	0.58	0.35
Mechanics	0.75	0.32
Cooks	0.59	0.19
Teamsters	0.51	0.24
Team and teamster	0.83	0.51

Average hourly wages of common labor are reported as follows: New England 53 cents; Middle Atlantic 48 cents; East North Central 41 cents; West North Central 33 cents; South Atlantic 27 cents; East South Central 23 cents; West South Central 24 cents; Mountain 39 cents, and Pacific 51 cents.

Utah Highways

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H. V. RICHARDS, Editor

OUR COVER PICTURE

The cover picture of this month's issue depicts one of the striking scenic features on the Red Canyon road, which, branching at Hillsdale on the Grand Canyon highway, leads to the colorful formations in far-famed Bryce canyon. The bright red colorings of the canyon walls and the kaleidoscopic changes of forest green and vermillion cliffs which unfold before the gaze of the traveller ascending the Red Canyon road, are so impressive that tourists have been known to return upon reaching the head of the canyon feeling that they had been to Bryce, mistaking for their objective the beauties of which is only the portal to the wonderland beyond.

A seven-mile project has recently been completed by the federal government in its program of forest road improvement over the section which was formerly rough going in Red canyon and transformed steep grades and sharp curves with numerous crossings over the uncertain bed of the wash to a fine wide mountain road affording an easy ascent to the tableland at the head of the canyon and the four-mile spur from the Hillsdale-Tropic road leading to Bryce. Due consideration has been given by the federal engineers to the aesthetic as well as the engineering features of the relocation so that not only is the canyon unmarred by the new highway but its scenic beauties are seen to much greater advantage.

TO PROSECUTE CARELESS USERS OF IRRIGATION WATER

Under the above head we note, in the Brigham City News, that the county attorney of Box Elder county is being urged to bring action against persons whose land abuts upon the public highway, and who cause or permit flow or seepage water to escape from their premises and flow upon the highway with the consequent danger of undermining hardsurface roads and causing chuck holes of mud and water in earth and gravel roads. Numerous complaints have been received recently that property owners along the hardsurfaced highway between Brigham and Hot Springs have permitted irrigation water to flow upon the road, causing real danger to traffic and injury to the pavement.

With the state undertaking this year to relieve the counties in part of the financial burden of road maintenance and with the necessity in view of conserving every dollar of the limited funds available, the road commission is particularly interested in seeing that no funds are expended in highway repair that is necessitated through the negligence of property owners in permitting irrigation and surface water to flow from their premises and upon the state highways. As tax payers these citizens should have the fact called to the attention that this careless use of water causes each year the needless expenditure of much public money and state road agents and patrolmen are instructed to protect the highways from this nuisance and where necessary report the violation of the law to the authorities.

Section 2840 of the state statutes makes those responsible for such water flow onto the roads guilty of a misdemeanor and a fine or imprisonment or both follows conviction.

The section cited reads, in part, as follows:

> "Any person who wilfully or carelessly obstructs or injures any public or other highway by causing or permitting flow or seepage of water; or who wilfully or carelessly permits water under his control to escape in any manner, so as to injure any public or other highway, or any person who shall wilfully or carelessly place or leave, or cause to be placed or left, any log, timber, stone, wood or other material, or any machinery, wagon, or other vehicle upon any public or other highway, in such a way as to obstruct the travel or to endanger property or persons upon such highway, shall be deemed guilty of a misdemeanor."

INCREASE IN REGISTERED MOTOR VEHICLES TOTALS NEARLY 3,000,000 DURING 1923

On December 31, 1923, there were 15,092,177 motor vehicles in use in the United States, according to statistics collected by the bureau of public roads of the United States department of agriculture. During the past year the number registered increased by 2,853,802 vehicles, a greater increase than in any preceding year.

This increase, which is 187,000 registrations greater than the gain in any other year, means that the public demand for road improvement, already strong, will be strengthened, and a more general use of the road, partcularly in a business and commercial way, will result. As indicative of the commercial trend motor truck registrations now total over one and one-half million, the hundred thousand mark having been passed in New York, Ohio and Illinois, and the fifty thousand mark in Indiana, Massachusetts, Michigan, New Jersey and Pennsylvania.

Total registrations now total over a million in California, New York, Ohio, and Pennsylvania.

While the owners of motor vehicles are insistent in their demand for more and better roads, the statistics show that they are bearing a very considerable share of the cost of the roads, especially of the cost of maintenance of the state highways. Gross receipts from registration fees together with the licenses of drivers, chauffeurs, etc., amounted to $118,900,000, or 23 times the amount derived from this source in 1913. During the same period motor vehicle registrations have increased twelve times.

In 35 states a gasoline tax ranging from one to four cents per gallon is imposed. Revenue from this source, amounting to $36,300,000, is spent very largely for highway purposes. This revenue will be materially increased in 1924 since in many states such taxes have been in effect only a few months.

Past experience seems to indicate that registrations will continue to increase materially during the present year. There is no doubt that road construction will continue at about the same rate which has been maintained for the past two years. Much of this construction will be on roads never before improved.

ACCEPTED BID PRICES AVERAGES FOR FEBRUARY

Average accepted bid prices on federal aid projects from all states awarding contracts during the month of February based on quantities as shown were as follows: Common excavation, 2,242,888 cubic yards, 38 cents; rock excavation, 211,447 cubic yards, $1.26; crushed stone in place, 70,383 cubic yards, $2.97; Class A concrete, 17,642 cubic yards, $19.00; gravel surfacing in place, 1,264,240 square yards, 32 cents; bituminous macadam, 179,784 square yards, $1.82; plain cement concrete in place, 238,457 square yards, $2.23; steel reinforcing, 2,786,006 pounds, 5 cents, and structural steel in place, 417,735 pounds, 9 cents.

February is not a month of heavy contract letting and in many states no federal aid contracts were let. For this reason the figures can not be said to represent an average for the country.

Status of Federal Aid Projects

By F. S. THOMPSON, Chief Draftsman

UNDER CONSTRUCTION MARCH 31, 1924

No.	County	Name	Type	Lgth.	Per Ct. Comp.	Contractor	Estimated Cost
-F	Emery	Castle Dale-Ferron	Gravel	11.5	99	J. T. Raleigh Co.	$114,765.24
-H	Emery	Rochester-Flat Bridge	Steel	75 ft.	4	J. T. Raleigh Co.	10,531.53
-ABC	Grand-San Juan	Moab-LaSal Junction	Earth	23.25	95	Hyde & Black	372.423.13
-A	Millard	Delta-Holden	Gravel	10.61	99	Johnson, Gillespie & Adamson	114,044.59
-G	Millard	Holden-Kanosh	Gravel	5.14	100	Johnson & Badger	29,146.30
-H	Millard	Holden-Kanosh	Gravel	5.75	100	Mathews, Barrus & Wrathall	30,478.61
-J	Millard	Holden-Kanosh	Gravel	7.80	100	Meadow Const. Co.	46,919.33
-B	Uintah	Ft. Duchesne-Vernal	Gravel	3.19	40	A. G. Young & Co.	
-C	Uintah	Ft. Duchesne-Vernal	Gravel	(1.31)	14	A. G. Young & Co.	69,596.17
-B	Uintah	Bridges for above	Wooden	4 Br.	38	Caldwell, Batty & Eaton	
-A	Washington	Ash Creek-Anderson's	Gravel	7.30	96	McArthur, Winsor & Whitehead	90,873.54
-A	Millard	Scipio-Juab	Gravel	7.08	88	Hawley, Anderson & Hinkley	48,288.16
-B	Juab	Chicken Creek, Millard Co.	Gravel	13.87	4	Hawley, Anderson & Hinkley	93,686.67
-C	Juab	Levan-Chicken Creek	Gravel	9.04	99	Paxton, Dorrity & Black	73,627.34
-A	Weber	Riverdale Overhead	Gravel	0.5	60	Union Construction Co.	43,072.63
-B	Weber	Bridge for above	Steel	144 ft.	30	J. J. Burke Co.	43,974.86
3	Cache	Sardine Canyon	Gravel	6.96	67	Olaf Nelson	114,448.37
9	Salt Lake	Magna-Tooele Co. line	Concrete	6.41	78	Moran Paving Co.	210,674.70
2-A	Wasatch	Heber-Hailstone	Gravel	7.46	54	Gilkerson Const. Co.	68,904.85
2-B	Wasatch	Hailstone bridge	Steel	63 ft.	99	Christensen, Jacob & Gardner	21,682.61
3	Sevier	Richfield South	Concrete	1.5	18	Gray & Murdock	62,569.52
5	Rich	Woodruff-Wyoming	Gravel	7.4	74	Kroft & Bundy	51,537.00
7-A	Sanpete	Moroni City	Concrete	1.0	97	Reynolds Ely Co.	39,237.73
7-B	Sanpete	Moroni-Fountain Green	Gravel	7.09	90	Reynolds Ely Co.	53,298.19
7-C	Sanpete	Fountain Green	Concrete	1.0	....	Reynolds Ely Co.	32,774.95
7-D	Sanpete	Fountain Green-Juab Co.	Gravel	5.33	40	Reynolds Ely Co.	45,064.48
9	Summit	Gogorza-Salt Lake Co.	Gravel	3.06	41	Moss, Snarr & Thayne	40,448.27
0	Utah	Payson-Juab Co.	Concrete	8.56	3	Wasatch Grading Co.	261,464.68
1-A	Tooele	Knolls-Wendover (Salt Sec.)	Earth	6.06	53	N. E. Lamus	66,120.00
1-A	Tooele	Knolls-Wendover	Gravel	39.55	10	Kroft, Bundy, Zimmer & Lamus	280,000.00
2	Sevier	Salina-Redmond	Concrete	3.0	40	Gray & Murdock	96,288.13
3	Juab	Nephi City	Concrete	1.77	65	Wasatch Grading Co.	36,070.43
4	Iron	Cedar-Kanarra	Gravel	12.01	0	J. T. Raleigh Co.	110,427.19
8	Box Elder	Cache-Mantua	Gravel	4.14	0	Wheelwright Construction Co.	84,078.83

Projects for which Plans have been Submitted

No.	County	Name	Type	Length
9	Davis	Layton-Clearfield	Hard Surface	4.11 Mi.
0A	Summit	Echo-Emery	Gravel	11.0 Mi.
6A	Iron	Parowan-Winn Hollow	Gravel	9.6 Mi.
7	Millard	Scipio-Holden	Gravel	12.0 Mi.

Plans in Course of Preparation

7A	San Juan	La Sal Junction-Wilson Wash	Gravel	7.0 Mi.
9B	Piute	Junction-Red Bridge	Gravel	4.5 Mi.
5A	Washington	Iron Co. Line-Ash Creek	Gravel	8.0 Mi.
1ABC	Sevier	Salina-Richfield	Gravel	18.0 Mi.
3A	Box Elder	Chase-Bear River City	Gravel	6.0 Mi.
3B	Box Elder	Bear River Bridge		300 Ft.
3C	Box Elder	Malad River Bridge		100 Ft.
5A	Utah	Orem-Wasatch Co. Line	Gravel	9.5 Mi.
70	Juab	Nephi-Levan	Gravel	9.0 Mi.
71	Uintah	Uintah River Bridge	Steel	100 Ft.
72A	Sanpete	Fairview-Mt. Pleasant	Gravel	5.0 Mi.

Surveys Completed

19D	Piute	Red Bridge-Garfield County	Gravel	3.5 Mi.
51B	Tooele	Timpie-Knolls	Gravel	35.0 Mi.
64A	Piute	Marysvale-Sevier	Gravel	4.9 Mi.
73A	Utah	Springville-Soldier Summit	Gravel	30.0 Mi.

Proposed New Work

68A	Millard	Dog Valley-Cove Fort	Gravel	6.0 Mi.
69	Iron	Parowan-Buckhorn	Gravel	14.0 Mi.
98A	Beaver	Wildcat-Millard	Gravel	6.0 Mi.
98B	Millard	Cove Fort-Beaver Co. Line	Gravel	3.0 Mi.

Contractors Resume Highway Work

The mild weather of the past few weeks has caused the resumption of work on practically all state road work which has been closed down for the winter. About the only exception being the Kroft & Bundy contract on the Woodruff-Wyoming road. This road is in a storm swept country which is rarely open until the first of May.

The Reynolds-Ely company have a large force at work completing their contract between Moroni and the Juab county line.

J. T. Raleigh has recently completed his contract in Emery county, F. A. P. No. 4-F, and moved his entire outfit to the Cedar City-Kanarra project in Iron county where he is making good progress.

The Payson-Juab county project will soon be the scene of considerable activity. The Wasatch Grading company have had a small force at work for the past few months working on the big fills and line change grading. They intend to start paving operations as soon as they complete the remainder of their Nephi City contract which they were unable to complete last fall on account of unfavorable weather.

Nelson and Tempest are busy completing the Sardine Canyon work on the east

slope of the Brigham-Wellsville route, while the Wheelwright Construction company have started a large force on their recently awarded contract for the relocation on the west side from Mantua to the summit. When completed this route will furnish an all year road into Cache valley.

In Sevier county Gray and Murdock have resumed operations on the three miles between Salina and Redmond on which 1.2 miles had been completed at the closing down of work last year. Grading operations are under way by these contractors on the one and one-half miles south from Richfield and pavement will be laid upon completion of the job in the north of the county.

On a number of projects favorably situated work has continued all winter, notably on the Wendover road where good progress has been made in spite of an unusual depth of water on the salt beds. Good progress has been made by Hawley, Anderson and Hinckley on their seven mile grading and gravel surfacing contract in Millard county. In southern Utah the state, completing projects where the contractor has withdrawn, has continued the construction of Project No. 6 in San Juan county and Project No. 12 in Washington county.

Contracts Recently Awarded

F. A. P. 56

Redmond-Sanpete county line, 2.1 miles.

F. A. P. 57

Gunnison-Sevier county line, 10.31 miles.

Bids were opened for the above combined projects April 8. Five bids being received, with that of the Reynolds-Ely Co. of Springville, the lowest at a total of $149,478.43. Their bid being well under the engineer's estimate the contract was awarded them April 10.

The Reynolds-Ely company is just finishing a project for the state between Moroni and the Juab county line. The grading on this job is practically complete and they plan to move their entire outfit to Gunnison in the near future. Gwynne Lewis, an engineer of much experience on state work, will be in charge for the state, assisted by Carl Erickson of Gunnison.

F. A. P. 24C.

Price Underpass and Price City paving, 1.125 miles concrete. The contract and bond covering the above project was approved by the commission April 2 and the contractor authorized to begin work. William Osborn, resident engineer, has left for Price to take charge of the work for the state.

This brings to a close negotiations extending over a long period, with reference to participation in costs of the railway underpass. The Utah Concrete and Stucco Co., who have this contract, expect to have a large outfit on the ground in the near future.

Contracts Recently Completed

F. A. P. 9G-H-J-K.

Holden-Kanosh-Millard county line, 23.7 miles gravel. The above projects, which constitute the largest single stretch of gravel highway of federal standards in the state, was completed last month. The road passes through the towns of Holden, Fillmore and Kanosh in the heart of Millard county. For the purpose of construction it was divided into four sections. Besides being an important state and intercounty highway this road is a link in the Zion National Park highway previously known as the Arrowhead Trail.

Motor Vehicle Registrations, Revenues and Gasoline Taxes for the Year 1923

State	Total Registration Cars and Motor Trucks	Receipts Registration Fees, Licenses and Permits	Receipts from Gasoline Tax (2)
Alabama	126,642	$ 1,541,017.56	$ 1,133,085.49
Arizona	49,175	281,670.75	474,123.0[illegible]
Arkansas	113,300	1,435,090.00	1,219,198.7[illegible]
California	1,100,283	10,608,544.00	2,518,893.0[illegible]
Colorado	188,956	1,126,218.55	846,353.12
Connecticut	181,748	4,329,432.16	880,222.7[illegible]
Delaware	29,977	516,209.00	88,579.2[illegible]
District of Columbia	74,811	357,918.00	.....
Florida	151,990	1,963,065.99	1,641,042.2[illegible]
Georgia	173,889	2,156,406.08	1,502,503.4[illegible]
Idaho	62,379	914,014.58	396,487.1[illegible]
Illinois	969,331	9,653,796.04	.....
Indiana	583,342	3,693,715.00	2,906,428.2[illegible]
Iowa	571,061	8,827,062.99	.....
Kansas	375,594	3,435,606.00	.....
Kentucky	198,377	2,678,732.89	680,435.3[illegible]
Louisiana	136,622	2,191,240.81	754,437.8[illegible]
Maine	108,609	1,660,268.17	286,076.9[illegible]
Maryland	169,351	3,536,955.20	688,304.0[illegible]
Massachusetts	481,150	6,989,633.25	.....
Michigan	730,658	10,500,786.05	.....
Minnesota	448,187	7,316,772.03	.....
Mississippi	104,286	1,077,616.22	467,855.5[illegible]
Missouri	476,598	4,016,383.60	.....
Montana	73,828	729,621.50	441,249.1[illegible]
Nebraska	286,053	3,353,175.32	.....
Nevada	15,699	153,988.10	115,843.2[illegible]
New Hampshire	59,604	1,571,326.96	163,064.6[illegible]
New Jersey	430,958	7,653,780.37	.....
New Mexico	32,032	295,000.00	165,000.0[illegible]
New York	1,204,213	19,862,441.52	.....
North Carolina (1)	(1) 246,812	(1) 3,728,044.72	2,909,904.7[illegible]
North Dakota	109,266	760,852.45	461,081.7[illegible]
Ohio	1,069,100	9,662,370.29	.....
Oklahoma	307,000	3,217,770.84	599,000.0[illegible]
Oregon	165,962	4,069,609.40	1,958,141.3[illegible]
Pennsylvania	1,043,770	15,844,303.80	5,491,522.6[illegible]
Rhode Island	76,312	1,286,659.47	.....
South Carolina	127,467	902,608.69	1,511,452.5[illegible]
South Dakota	131,700	1,130,959.27	624,692.4[illegible]
Tennessee	173,365	2,049,653.27	812,356.6[illegible]
Texas	688,233	5,441,508.59	1,215,623.3[illegible]
Utah	59,525	430,104.72	404,085.8[illegible]
Vermont	52,776	938,860.30	168,172.8[illegible]
Virginia	218,896	3,200,161.66	1,556,920.9[illegible]
Washington	258,264	3,898,597.77	1,225,149.6[illegible]
West Virginia	157,924	2,608,508.37	366,490.0[illegible]
Wisconsin	457,271	4,958,933.55	.....
Wyoming	39,831	414,096.39	140,161.6[illegible]
Totals	15,092,177	$188,970,992.24	$36,813,939.61

(1) For the first six months of the registration year which begins on July 1.
(2) In several states gasoline tax in effect only part of the year.

Final payment to Utah of the $50,000 subscribed by California toward the construction of the Wendover cut-off section of the Victory highway was received recently and Fred H. Meyer, president of the Utah-Nevada-California Highway association, states that $20,000 has been practically subscribed as the initial payment to Nevada on the tri-state agreement whereby California was to pay $100,000 equally to Utah and Nevada for the improvement of several sections on the Victory highway west from Salt Lake.

The contractors are making good progress on construction of the Wendover road, the two miles from Wendover to the mud flats have been graded and gravel-surfaced, trenching machines are at work on both sides of the salt section and on the salt section itself the grading is about completed.

A hard surfaced highway connecting Plain City and Ogden is to be added to Weber county's improved road mileage, the commissioners stating that construction will start at once, beginning at the Oregon Short Line tracks at Harrisville and will be extended this year through Farr West.

SPARKS from the Road Drag

Always the Case

Some of the best repartee in the world occurs to the driver a couple of hours after his argument with the traffic cop. —Ohio Motorist.

Dear Old Lady—In my day children were seen and not heard.

Infant Flapper—Well, I guess you got in a lot of dirty work on the quiet!—Yale Record.

Modern Maid: "You tickle me, Duke."

The Duke: "My word, what a strange request."

Surprise

The first asphalt road in the United States was built in 1879 in front of the City Hall, Newark, N. J.—Newspaper Item.

This will come as a surprise to about 365,981 motorists who thought they drove over it this summer in other cities. —Lackawanna Motorist.

Same Feeling

"Have you ever taken a tail-spin in an airplane?"

"No, but I've been called upon unexpectedly to make a speech, and I guess the sensation is about the same."

---

100 Per Cent Perfect

"Knee-length skirts have reduced street car accidents fifty per cent."

"Wouldn't it be fine if accidents could be prevented entirely?"

At Washington

In the capitol at Washington the chaplain looks at congress and prays for the country.—The Automobiler.

In Memoriam

Here lies the body of "Stubborn Gray";
Who died maintaining his right of way.
He was right, dead right, as he sped along,
But he's just as dead as if he'd been wrong.

E. C. Knowlton, assistant engineer, on a snow investigation. The best, in fact, the only time to test out the advantage of a proposed location for an all-year route is in the winter. "Jerry" plowed through miles of warped scenery last winter in the forbidding mountain fastnesses and says he believes in being prepared for eventualities.

And Sometimes Kicks

Father (upstairs): "It is time for that young man to go home."

Young Man: "Your father is a crank."

Father (overhearing): "Well, when you don't have a self-starter a crank comes in mighty handy."—Pitt Panther.

Village Doctor (to old elder)—"But surely, Saunders, you'll have a drop of something before you go?"

Saunders—"No, thank ye, doctor. I've three good reasons for refusing your hospitality. First, I'm chairman o' the local temperance society; second, I'm just gaeing tae a kirk meeting, and third, I've just had one."

Hard Boiled

The black-haired waitress, very much out of sorts, sailed haughtily up to the table at which sat the grouchy customer. She slammed down the cutlery, snatched a napkin from a pile and tossed it in front of him.

Then striking a furious pose—

"Whatcha want?" she snapped.

"Coupla eggs," growled the diner.

"How ya want 'em?"

"Just like you are."

Happy Water

Ole Olson came into a Minnesota village one day and inquired at a drug store if they had any "squirrel" whisky.

"No," said the clerk, "but I can slip you a little 'Old Crow'."

"Aye don't vant to fly," said the Swede, "Aye yust wan to yump around a little."

Reason to Scratch

Captain—Sam, why do you scratch your head so hard?

Sam—Why, I got dem rithmetic bugs in this man's army.

Captain—They're called cooties, why do you call them arithmetic bugs?

Sam—Well, sir, dey add to my discomfort, subtract from my pleasures, divide my attention and multiply like the dickens.

Lucky for Johnnie

Teacher asked her class if they could compose a rhyme using the word "Nellie." Johnnie Jones, being called upon, arose much embarrassed: "There was a pretty little girl named Nellie, who fell in the water and wet her little feet."

"Why, Johnnie, that don't rhyme."

"I know it doesn't. The water wasn't deep enough."—Ke-Nash-A Club News.

After purchasing a quart I found it corroded my zinc-lined interior, so I gave it to Al, our saddle-colored janitor. Later I asked him how he found it. He replied, "Jes' right, Cap'n, jes' right." "What do you mean, 'jes' right'? said I. "Well, suh, Cap'n, if it had been any better you wouldn't have give it to me, and if it had been any wusser I'd a died. It was jes' right."—Exchange.

A congressman once declared in an address to the house:

"As Daniel Webster says in his great dictionary—"

"It was Noah who wrote the dictionary," whispered a colleague, who sat close by.

"Noah, nothing," replied the speaker. "Noah built the ark."

Expenditures on Zion Park Highway and Victory Highway Compared

Some interesting figures were recently compiled showing the expenditures on the Zion Park highway and the Victory highway. The statement has been made that the commission, in the construction of the Wendover cut-off, was spending an unjust proportion of the state and federal funds, and was especially discriminating against the Zion Park highway to Los Angeles.

The figures, as compiled, show that including the 1924 proposed work, that $3,500,000 will have been spent on the Zion Park highway by the end of 1924. Considering this expenditure on the total distance between Salt Lake and the Arizona line, 352 miles, the average expenditure is approximately $10,000 per mile.

On the Victory highway, on the other hand, at the end of 1924, $1,250,000 will have been spent on this outlet to San Francisco, and again considering the total length from Salt Lake to the Nevada line of 137 miles, gives an average of $9,000 per mile, $1,000 less than on the Zion Park highway. Again, taking into consideration the projects which are tributary to the Zion Park highway and the Victory highway, still more interesting facts are obtained. Including these tributary highways, we will spend at the end of 1924, $5,000,000 on the Zion Park highway, or an average over the entire distance of $14,000 per mile. There are no tributary projects to the Victory highway and therefore, under this interpretation, $5,000 more per mile has been spent on the Zion Park highway than on the Wendover connection.

In obtaining these costs the only projects considered on the Zion Park highway were hard surface pavements from Salt Lake City to Nephi, plus completed, under construction, or proposed federal aid projects between Nephi and the Arizona line, and for the Victory highway the pavement from Salt Lake City to the Tooele county line, plus the federal aid projects under construction or proposed from the Tooele county line to the Nevada state line.

In light of the above data and also that less than $600,000 of the $6,000,000 for federal aid allotment to Utah will have been spent on one of the most important interstate connections in the United States, the commission feels that it is justified in its action.

Help the Car to Keep That Satin Complexion

Just now when the usual spring drive is on with the pressing insistence and advice that we clean up yards and alleys, trim the trees and doll up the front porch with a new coat of paint the suggestion is not amiss that the auto also come in for a fair share of attention. It will respond nobly to a little well-directed effort and reasonable care will keep it in such condition that it will match well with and duly advertise our neat and well kept premises. It is not so much the make of car as the care which is bestowed upon it which proclaims the kind of motorist. The experienced driver keeps his ear cocked for squeaks and knocks and knows that prompt attention will keep the repair bill within reasonable limits and it is worth remembering that proper care of the paint surface and the top and upholstery will pay dividends in the long run. The Maine Motorist publishes some helpful suggestions under this head which every car owner can easily apply:

"To create a good impression means a little thought and elbow grease spent on keeping the machine looking young and 'peppy.'

"A weekly cleaning with a gentle stream from a hose, followed by a drying with a clean chamois, with as little rubbing as possible, will do much to preserve the body finish. And a cleaning of the motor is just as important.

"Whenever you come in with rain or snow on the car, dry it off before you close the garage. This will prevent the formation of paint destroying spots.

"Never let water freeze on the polished body of your car.

"Many an old car has been made to look like new with a few coats of paint and a recovering of the seats and top.

"If fenders begin to look dull, clean them carefully with gasoline, let it dry, then apply a couple of coats of good automobile varnish. Only takes a few minutes and a dollar or so but makes a lot of difference in looks.

"To clean leather upholstery, automobile tops and bodies with gasoline is to ruin their finish forever.

"Curtains should be dried while fastened in place. They will mildew if folded and put away wet.

"To wash a car when it is hot is a good way to spoil the finish, especially if the car is new and the paint not yet set.

"Mud allowed to cake on the car will give it the appearance of having the measles when washed off. It should be removed—gently—when still wet.

"When you are going to drive through a lot of wet weather, it will save a lot of work later if you cover the nickel parts with vaseline.

"Leather upholstery and tops can be given lengthened life by a washing in plain water with a little ammonia, a brisk rubbing with a soft cloth and then an application of leather and top dressing, obtainable at any harness maker's and many other places. Or you can make good leather dressing yourself—two parts of linseed oil to one of turpentine."

Eliminate Sharp Curves on Highways

Reduction of sharp curves with consequent gain in sight distance and increased safety to traffic on heavy-travelled roads will be undertaken at once in accordance with a decision reached by the road commission. As a result of this action a survey was ordered through the town of American Fork and is now being made under the direction of Resident Engineer R. B. Patterson, it being the intention to eliminate two sharp curves here by a highway relocation. At Santaquin additional right of way will be purchased and a longer radius curve introduced in the construction of the paved highway from Payson to the Juab county line on which the contractor has now commenced grading operations. Another improvement contemplated is the elimination of a right angle turn in the Ogden-Salt Lake highway at Farmington.

Improvements to be made in Millard county this year include the grading and surfacing with gravel of the road from Lone Tree, one mile south of Delta, to Oasis, Deseret and Hinckley, a distance of eight miles; the road between Delta and Lynndyl will also come in for some extensive improvements this year.

E. C. Lee, state road agent of Carbon county, has been making splendid progress during the past open winter in construction of the dugway section of the Price Canyon road, and it is thought that the road will be completed to its twenty-foot width and opened to traffic by May first.

Work on the Riverdale viaduct is proceeding under the direction of O. A. Troseth, resident engineer. J. M. Tracy, previously in charge of the work, and who has been in the state service for two years on location or as resident engineer in charge of construction, has resigned to become city engineer of Ogden.

As a result of the floods last summer in Davis county and the filling of stream channels with gravel and boulders it appears that at Farmington it will be necessary to raise the grade of the highway and construct a new bridge over the Farmington creek crossing. A temporary bridge has been erected at this point, spring freshets spreading from the blocked channel having flooded the highway and adjacent railway tracks.

Records in the office of the Ogden city engineer show that the city has 30 miles of paved streets. The steady growth of the city and the opening of new residential districts necessitates a continued paving program and the improvements to be made this year will add two and one-third miles to the paved streets of the city.

"The Road to Happiness," a Highway Motion Picture

"The Road to Happiness," a highway film produced jointly by the Ford Motor company, the National Automobile Chamber of Commerce and the Highway Education Board, is one of the most interesting highway pictures thus far produced.

Taken in Fairfax county, Va., about twenty miles from Washington, the picture tells the story of the influence of improved highways upon the social, educational, religious and economic phases of life in rural communities, and the need for skilled highway engineering in bringing about the improvement. The picture was made under the advice and guidance of the bureau of public roads, U. S. department of agriculture, and President Coolidge, who is a strong believer in the value of road improvement appears as one of the principal characters in his proper role as president of the United States.

The story has to do with the life of a farm lad, Bob Preston by name, reared in an old farm home on a mud road, surrounded by all the handicaps, difficulties and discouragements attendant upon such an environment.

One of the hardest of the chores which, as it seems to Bob, leave no time at all for play, is the daily trip to meet the morning milk train. Never a morning but the break of dawn brings the inevitable paternal summons to arise from pleasant dreams and set out upon the hard and disagreeable journey—for journey it is to Bob, an exasperating, wearying journey that ctsts a shadow over the whole day. On account of the lamentable condition of the road Bob knows that he must allow himself plenty of time if he hopes to meet the train, but he never knows when he sets out what new trial is in store for him. One day it is a broken culvert, another the road is axle deep in mud, and so it goes. As the picture opens Bob is snatching a hasty breakfast to fortify him for the usual morning trip. He is already a half hour behind his usual time and his father is in a testy humor. Setting out with the customary load of milk and fresh vegetables, he is entrusted by his mother with a basket of eggs the return from which will be put away against the day when she will have enough for a new dress upon which she has set her mind. Although Bob doesn't really care a rap whether the milk ever gets to town, he is determined to get those eggs to market, but he has failed to reckon with the road which is in the worst imaginable condition. One mishap after another occurs, culminating in heart-breaking disaster when the precious eggs fall from the wagon and Bob sees the realization of his mother's dream—too long put off—delayed still further. To cap the climax a wheel comes off when he is within sight of the station, and the train pulls out before his eyes.

Discouraged and worn out, Bob shakes his fist resentfully at the road—the cause, as it seems to him of all his troubles—and turns the mare homeward to explain as best he may to his irate Dad his failure to meet the train. Not fully sensing the importance of improving the road the father attributes the trouble to Bob's laziness and packs him off to school.

Had Bob but known what that day held in store for him it is likely that he would have quickened his laggard footsteps as he picked his way from mud puddle to mud puddle. An opportunity is about to be held out to him which is to change the whole course of his life. His teacher announces that an essay contest is being held under the auspices of the Highway Education Board. A free, four-year college scholarship is offered for the best essay on the subject, "What have good roads done for my community."

The hopelessness engendered by his all too intimate knowledge of the burdens imposed by bad roads inspires Bob's question, "How are we going to write an essay on that subject when we haven't a single good road in our community?"

Nevertheless he resolves to try to win the prize and that evening finds him engaged in his maiden attempt at authorship. His first efforts are not successful. The transfer of thought to paper he discovers is not an easy task, and he receives little encouragement and less help from his father. But his mother's heart is set upon the winning of that contest and at her suggestion they all attend a good roads meeting at the town hall on the following evening. At this meeting the words of the lecturer and a pamphlet he receives gives Bob the inspiration for his essay. The words that especially impress themselves upon his memory are these: "And so I say that we pay for improved roads whether we have them or not, and we pay less if we have them than if we have not." The words are quoted from an address by Thomas H. MacDonald, chief of the U. S. bureau of public roads.

Knowing, by personal experience, the tremendous costs of bad roads, Robert takes these words as his text and submits an essay which is selected as the best of the thousands submitted by high school students all over the land.

From this time the action of the story moves rapidly. Robert receives the scholarship at the hands of the president himself. He attends college and is graduated as a civil engineer. Seeking employment, he calls upon the chief of the bureau of public roads, and is assigned to work as a highway engineer on the government's road improvement work in the national forests of the west. This assignment provides the opportunity for inclusion of interesting pictures of difficult road construction work in the west.

In the meantime the words of the lecturer which inspired Robert to write his winning essay have borne fruit in his home community and the sentiment favorable to road improvement has resulted in the passage of a bond issue. Having heard of Robert's success as an engineer with the federal bureau the county commissioners decide to place him in charge of the proposed improvements in the home county. Gladly accepting their offer Robert is soon busily at work. The dirt begins to fly and before long a new paved road has taken the place of the old mud road to the station, and the doctor, the farmers, the merchants, the school children, the mothers and fathers and all the people of the county learn by actual experience the truth of the maxim that "we pay for improved roads whether we have them or not, and we pay less if we have them than if we have not."

And the real moral of the whole story, to quote Robert's own words, is this: "What Clay county has done, any county can do."

The film is distributed by the Ford Motor company through its numerous branches, and is available for use in schools and at public meetings without charge other than the cost of transportation. Full information can be obtained from the Ford Motor company, the National Automobile Chamber of Commerce, the Highway Education Board or the U. S. Bureau of Public Roads.

Mother and son were at the circus.

"Mother, ain't that elephant big as hell?" asked the young son.

"Why, son, haven't I told you time and again not to say 'ain't'?"—Boll Weevil.

A Dumb-Bell

I thought a thought, but the thought I thought,
Was not the thought that I thought I thought,
And so I think, if again I think,
I'll write it down with pen and ink.

Heard recently of a poet who wrote about the "Window in His Soul." Wonder if he's any relation to the guy who had a pane in his stomach?

He tried to cross the railroad track
Before a rushing train;
They put the pieces in a sack,
But couldn't find the brain.
—Olivia Times.

Heard at the Navy Crew Race

Biddie: "I suppose you have been in the navy so long you are accustomed to sea legs?"

Middie: "Lady, I wasn't even looking."—Tiger.

Speaking of Bay Windows

Gam—"You haven't seen my belt around the house, have you?"

Mrs. Gam—"Oh! did you put it around the house?"

Thwarting King Winter in Utah

BY BRIG ROBINSON

For years past the state has been following inherited policies closely imitating those of the bear in hibernating over the winter months. The first heavy fall of winter snows would blockade the highways, closing them to all traffic until the northward journey of a friendly sun would again open arteries of commerce to travel. Garage doors would be closed for the winter and motor vehicles restricted to paved highways or put in storage to await the spring awakening.

But nature's course even through mountainous passes of the Rockies has again been set aside by man and no longer will the first snowfall drive the wheeled quadrupeds into their holes for the season.

To picture the main arteries of travel over the Rocky mountains maintained open to traffic the year round within a few years would not require any great flight of the imagination so far as Utah is concerned. To follow that picture to its ultimate conclusion and see the golden stream of tourist travel wending its way to the sunny south over the Arrowhead Trail to southern California would be but another step.

As inevitable as good roads that winter stream of travel is coming. Probably California offers its greatest enchantment as the land of eternal sunshine during the winter months when freezing temperatures drive outdoor folk behind closed doors to the warmth of the hearth. Railroads have to date afforded practically the only means of following the lure of the sun and even when there the outdoor man is deprived of his car and freedom of movement without some expense prohibitive to the ordinary bank account. Year-round maintenance of roads would reverse the order of things and offer a comparatively cheap means of transportation, at the same time allowing a freedom of movement not now realized.

Snow removal as an economic factor in highway maintenance was demonstrated in Utah last winter when the entire Arrowhead Trail from Arizona to the Idaho state line and the Pike's Peak Ocean-to-Ocean highway from the Arrowhead Trail at Cove Fort to the Colorado-Utah boundary were kept free from snow or ice blockades for the entire season.

Near the Idaho state line on the north some difficulty was incurred due to the building of the Wellsville-Mantua road up the Sardine canyon, making a detour necessary. The route has now been located where the snowfall is lighter and when completed will be kept open the year round.

The first experiments on the northern end of the Arrowhead Trail near Salt Lake City were made a few years ago over a distance of some few hundred miles. The fact that no snow fences or artificial means were resorted to made failure appear certain yet so satisfactory were the results that each year passing has seen greater attention being paid to the matter.

Work has been seriously handicapped by an inadequate organization. Whatever has been done has been entirely within the jurisdiction of the various county commissions working individually and independently of each other and a lack of coordinated effort resulted. Now, however, the state proposes to enter on a new phase of highway maintenance made possible by the gasoline tax.

"Clear the Track" for One Million New Drivers

In a bulletin just issued by the traffic committee of the American Automobile association motorists are given timely warning against confusing the "road hog" with the inexperienced driver whose lack of courtesy or recklessness may be unintentional.

According to the A. A. A. paper every spring brings its list of preventable accidents as a result of experienced drivers mistaking unintentional for wilful recklessness and violation of rules of the road.

As a result of several recent investigations into accident causes in which it was shown that collisions often resulted from the inability of seasoned drivers to make allowances for the shortcomings of beginners, the A. A. A. has outlined for motorists some suggestions as to safeguarding car users through better understanding between drivers.

The recommendations of especial importance are as follows:

"Whenever a driver seems to be usurping the right of way at an intersection when he is not entitled to do so it is safer to assume that he or she is inexperienced and not wilfully disrespectful of law and order. Too many motorists seek to 'teach others a lesson' at the wrong time, and the inevitable result is an accident.

"The proper time to teach the new driver the rules of the game is before he has to apply them. The experienced driver who leads the beginner into believing that the only way to learn to drive is to enter heavy traffic and 'sink or swim' is only encouraging the worst form of recklessness.

"The wilfully reckless driver may change his mind at the last moment and avoid trouble simply because he drives well enough to know how to avoid it, but the inexperienced driver has no such advantage.

"There will be about 1,000,000 new drivers this year if car sales continue at the present rate. While skill in operation of the car is an easier matter to acquire by reason of the great improvement in controls, traffic conditions are more complicated than at any time in the history of the automobile and knowledge of rules of drivin gand courtesy never more important.

"In view of present conditions the experienced motorist cannot afford to mistake ordinary inexperience for wilful recklessness. The man in the powerful phaeton who passes you at a dangerous point on the hill may be simply someone who does not fully appreciate the risks he is taking. If you are a true worker for safety you will do everything in your power to make it less likely for this inexperienced driver to come to grief.

"This means that you must give way to him at crossings, fall back on the hill if he tries to pass and shows signs of getting caught between your car and a machine coming down hill, and apply your brakes cautiously when he is following you in traffic.

"It means that at every curve in the road you should sound your horn, because in all probability he will overlook this point.

"The beginners will learn, but in the meantime safety rests with those experienced drivers who are in a position to offset the beginner's shortcomings."

Slight Mistake

"Jimmie," said the teacher, "why don't you wash your face? I can see what you had for breakfast this morning."

Little Boy—"What was it?"

Teacher—"Eggs."

Little Boy—"Wrong, teacher; that was yesterday."

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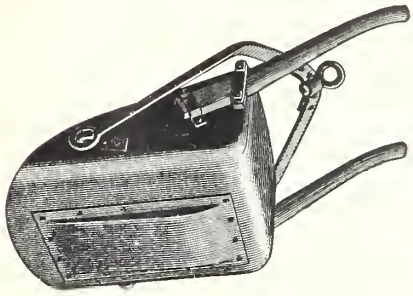

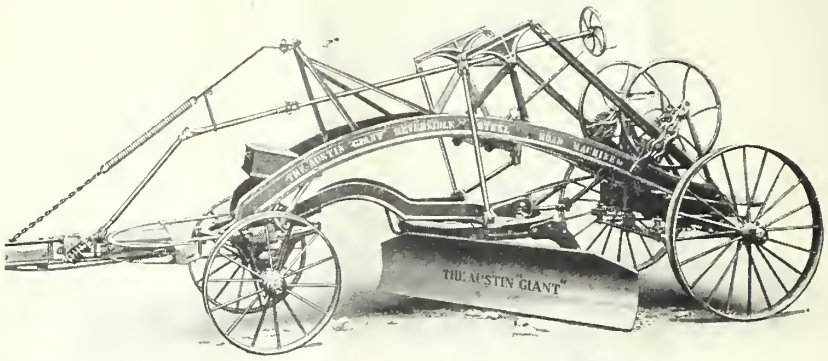

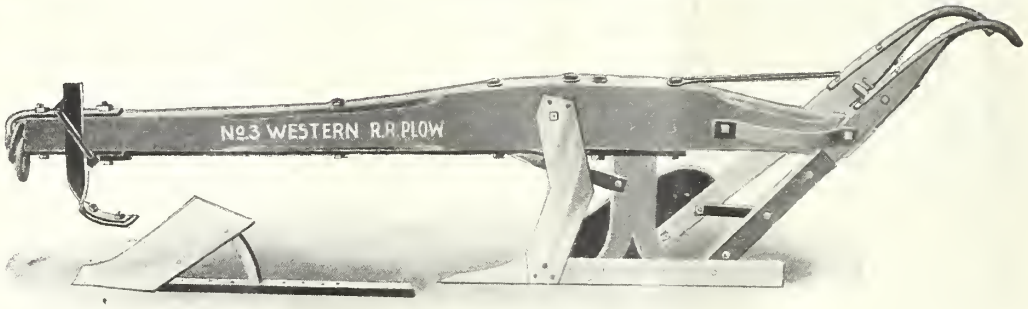

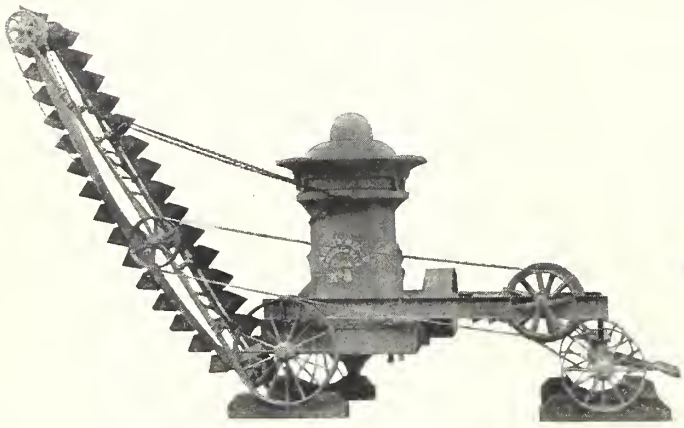

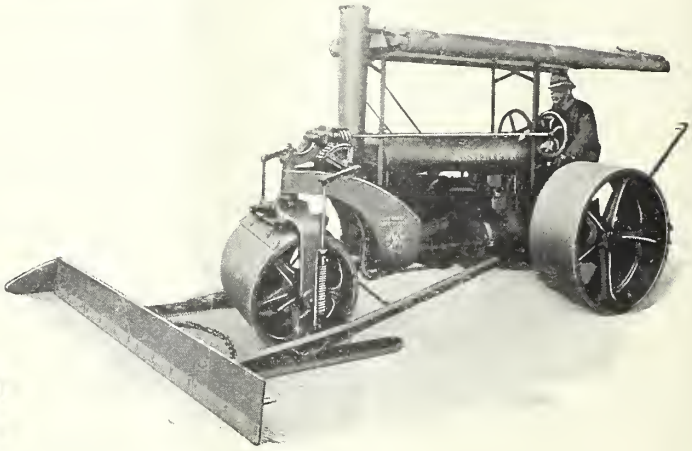

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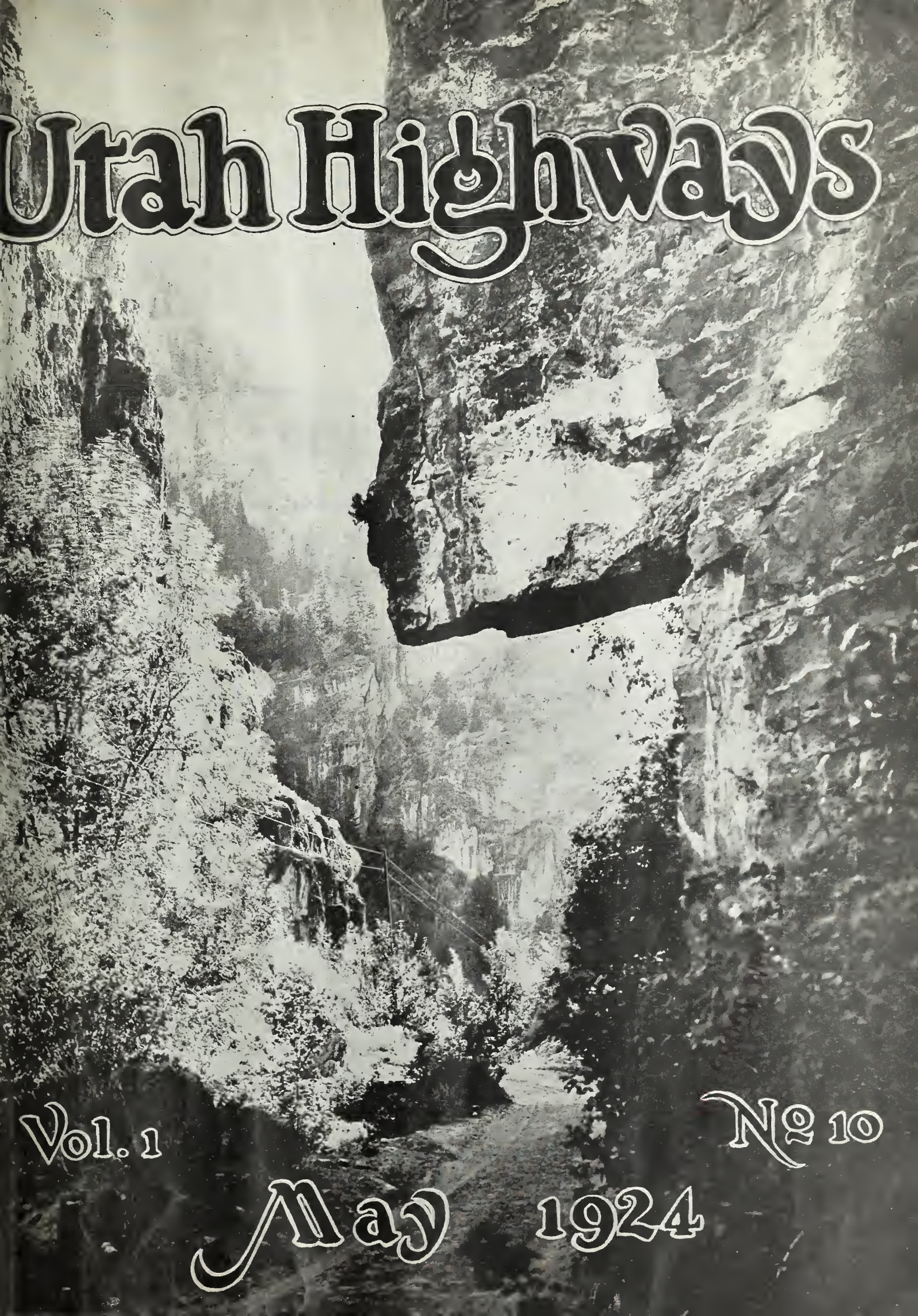
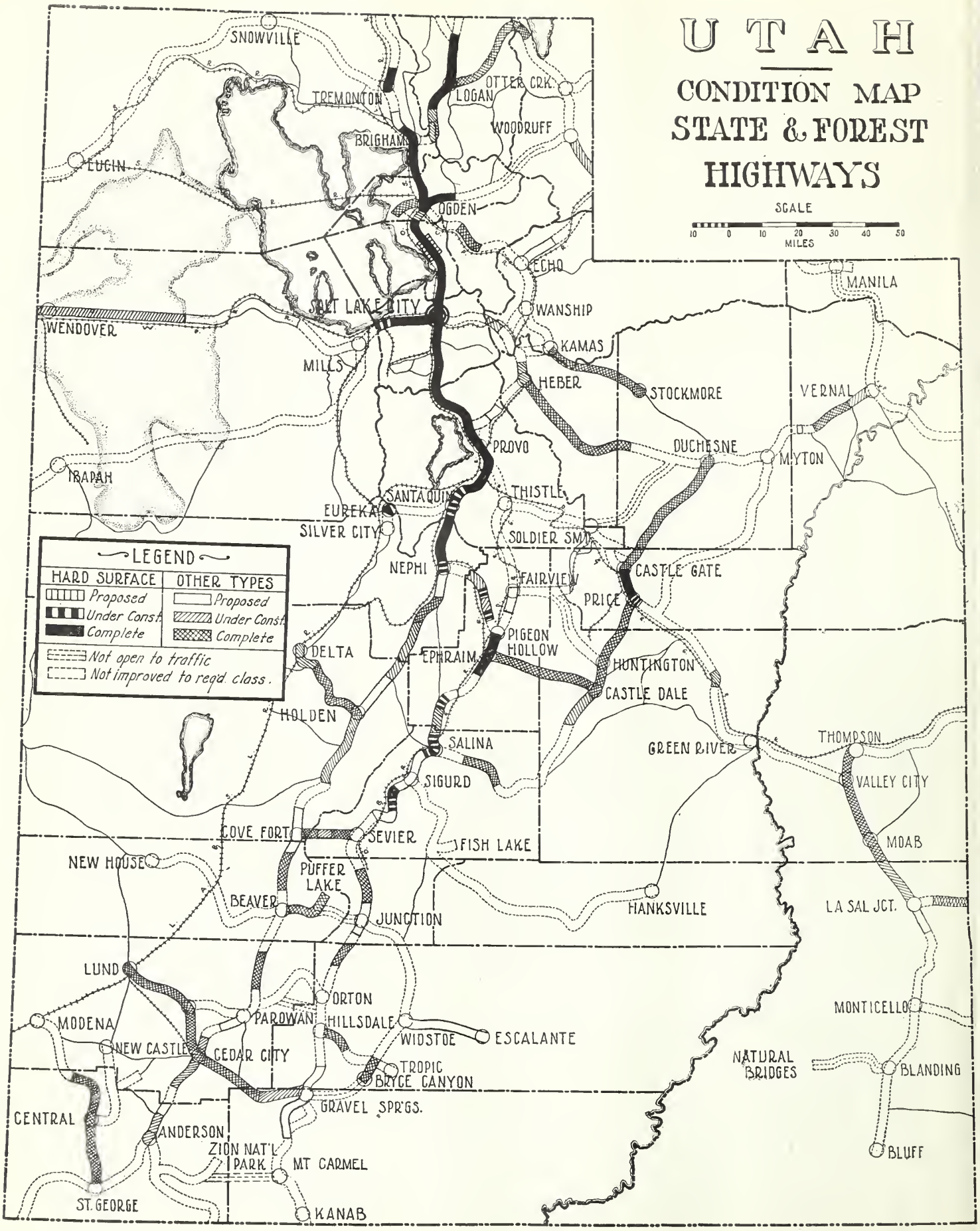


Vol. 1 № 10

May 1924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Not open to traffic
Not improved to reqd. class.
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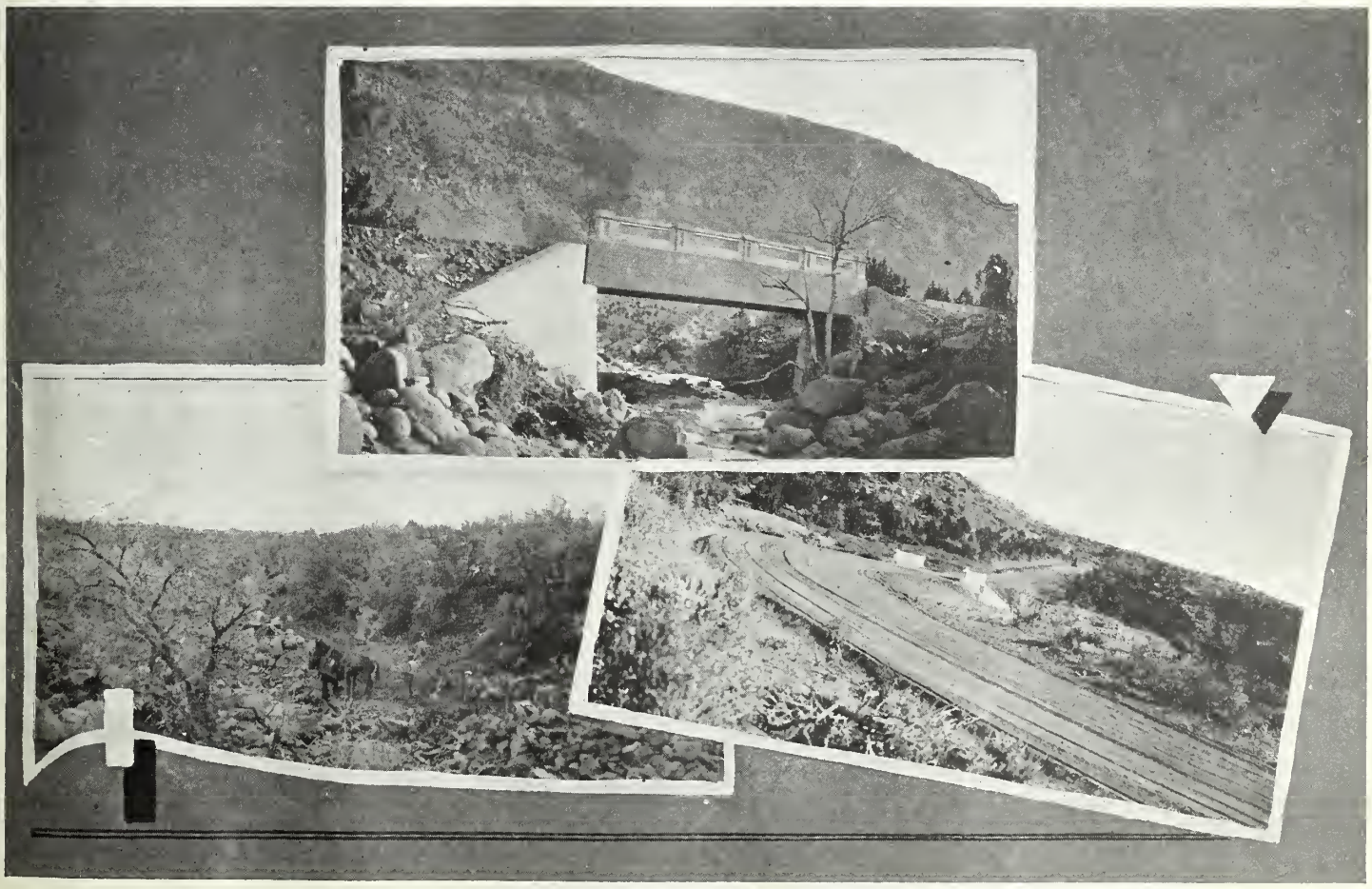
Utah Highways

VOLUME 1. MAY, 1924 NUMBER 10

State Forces Finish Washington County Project

A notable addition to the improved mileage of the primary north and south road, the Zion Park highway, has been made in the recent completion of 7.3 miles of gravel surface in Washington county between Ash creek and Anderson's ranch, Federal Aid Project No. 12, built partly by contract and completed by state forces upon the withdrawal of the contractor. Most of the construction has been over rough, boulder-strewn slopes. These big, black rocks have been the anathema of road builders and road users in Washington county since the first prairie schooners floundered over them enroute to southern California. Pictures in this issue give an idea of the material encountered in excavation, much of which was more difficult to handle than solid ledge rock would have been. A particularly trying section was that known as "Little Black Ridge," just north of Anderson's ranch. The first road constructed in the locality followed the western slope of this ridge. It was so difficult to negotiate that some twelve years ago the road was relocated around the east side of the ridge. Good road making material was scarce and as the road wore down under traffic it became noted for its extremely rough and rocky going, all on a very steep grade. The location selected for the recently completed project was to the west side again and lower than the original highway. A great improvement in curvature and grade has been secured and the chief difficulty, which was to finding sufficient earth for the construction of a



F. A. P. 12—Views show beginning excavation at a bridge site, completed bridge at Station 1765, and structure with portion of completed roadway at Dry Sandy

suitable subgrade for the gravel surface, has been most satisfactorily overcome.

In spanning the gorges of the streams coming down the slopes of the Pine Valley mountains, four concrete bridges were constructed under a separate contract, one of these, a 35-foot span, two of 40 feet, and one 45 feet. These bridges were originally designed to have cement rubble abutments but due to difficulties in obtaining sufficient building stone of good quality the abutments were all built of concrete and at some reduction in cost. Excellent work has been done on all of these structures by the bridge contractors, Snow, Cannon and Kemp. The character of the work done and the general appearance of the completed project is second to none in the state. It unfortunately happened that the bridge and also the road contractors, McArthur, Windsor and Whitehead, lost money on their contracts, one of the contributing factors being the unusual call for local men and teams on both road and railroad last year, with resulting higher prices for labor than had been anticipated.

The bridge contractors were financially able to complete their work but the road contractors found it impossible to continue and ceased work September 17, 1923, the work being then 60 per cent complete. The bonding company then proposed to complete the work on a bid which the contractors considered too high and they appealed to the commission to take over the work and handle it directly. This the commission decided to undertake, work being resumed by the state under force account November 23, 1923, and carried forward continuously until accepted by state and federal engineers, April 16, 1924. Edwin Higbee of Toquerville was appointed superintendent of construction by the state and completed the work in a most satisfactory manner, and not only that but affected a saving to the state of $11,500 as the difference between the cost of the work at the unit prices of the sub-contractors of the bonding company and the cost under force account. The cost of the work while under the control of the state has also netted some profit to the contractors and materially reduced the loss sustained on the project as a whole. The total cost of the project is about $150,000, of which the bridges cost $60,000.

In completing the project the contractors have rendered all possible cooperation and continued at work as a part of the state forces until the job was completed and accepted by the inspectors.

The general appearance of the completed work throughout is highly creditable and speaks well for the contractors and the engineers in charge. The standard of finishing up of this project refutes the claims sometimes made that the commission is more lenient with local contractors than they are with the more experienced and established firms.

The road is now being maintained by a state patrol with the cooperation of Washington county under the plan adopted by the state whereby all improved mileage is to be placed under the care of efficient maintenance patrols immediately following the completion of the construction contract. The county some time ago accepted the proposition of the commission under which funds are provided on a "50-50" basis for maintenance of the state roads, Washington being the first county to accept the state's proposal.

It is planned to continue with the improvement of Washington county roads, particularly those in the vicinity of Zion park, as fast as necessary funds are available. Plans have already been submitted to the bureau of public roads covering the remainder of the state highway between Anderson's and the north line of Washington county. The route selected follows the west side of Ash creek until the summit of the Black Ridge is surmounted. The construction of this road will leave the present route on the east side open to traffic and in no way interfere with the heavy summer traffic via St. George or over the spur from Anderson's to Zion park.

Pavement Resurfacing in Davis County

The first contract to be let by the state covering extensive pavement repairs will be let this season for the resurfacing of 4.11 miles between Clearfield and Layton, as Federal Aid Project No. 59. Plans and estimates have been submitted to the bureau of public roads and as soon as approval has been granted the commission will advertise for bids.

The present pavement is a 16-foot concrete slab, 6 inches thick at the edges and crowned to a thickness of 8 inches at the center line. The pavement was laid in 1915, the work being done by state forces. Grading commenced in June of that year, the laying of concrete was begun July 23. at a point 0.6 miles south of Clearfield and carried continuously to Layton where work ceased November 4. An average of 65 convicts from the state penitentiary and 20 hired employes constituted the working force required for the one mixer used on the job. Cement was obtained from the Devil's Slide plant, the sand and gravel from the St. Joseph pit owned by the county, a 1:1¾:3½ mix being used. Expansion joints of tarred felt were spaced at an average of 25 feet apart. It is fortunate in view of the subsequent wear of the surface of this pavement that no steel armor plates were used in the joints as was frequently the case in these early pavements.

The grading was light over most of this project and although the paving operations followed the grading very closely for the first mile there is hardly any evidence of unequal settlement, there being no extensive longitudinal cracks or displacement of slabs. The excessive wear which has made this pavement difficult to travel over has never been satisfactorily explained, the same materials and grading have produced good pavement elsewhere on the state road in Davis county.

Two types of pavement, one concrete, the other bituminous, are to be considered in awarding the contract for resurfacing, each of which calls for two foot concrete widening strips to the present pavement, increasing the width from 16 to 20 feet.

For the concrete type the requirements are a resurfacing layer 4 inches thick at the center line, poured without longitudinal joint, with a one-inch crown, the 20-foot finished pavement to be 11 inches thick at the edges. A net section figures 0.358 cubic yards of concrete resurfacing per linear foot of pavement to which is added a volume sufficient to take care of the inequalities of the present surface and the cutting of the slab for corrective drainage structures. A total of 8200 cubic yards of concrete resurfacing will be required for this type, the basis of payment to be on a cubic yard instead of a square yard basis. Transverse joints, conforming to the intervals in the old pavement, will be required and woven wire mesh reinforcement is to be used throughout, of a weight not less than 31 pounds per hundred square feet.

The bituminous type is of two courses 18 feet wide between 12-inch concrete headers, the first a binder course of black base with a minimum thickness of one inch, estimated at 2500 tons, and a 2-inch wearing course of 43,439 square yards. This type will have a 2-inch crown, the concrete widening strips being 9 inches thick at the edge of the completed pavement.

To facilitate the curing of the concrete side strips on this type the state will furnish flaked calcium chloride, to be used at the rate of 2½ pounds per square yard, obviating the necessity of watering the concrete surface during the process of curing, except immediately after laying, when requirements call for a covering of wet burlap for a few hours prior to spreading calcium chloride.

By the use of this method of curing which is fully described elsewhere in this issue, it has been found that a road may be closed to traffic only half the usual time allowed for curing, the resulting concrete being of equal or greater strength than that cured by ponding or sprinkling. While the calcium chloride method is entirely in the experimental stage so far as our climatic conditions are concerned, it is considered feasible to test its applicability to this region on the strips used to widen the existing pavement, in case it is decided to resurface with the bituminous type.

Move Town from Railroad to Paved Highway

That "the old order changeth" is exemplified in the recent action of the Texas town of Reno on the Texas and Pacific railroad. Only four trains a day passed through the town while a half mile away was a steady stream of traffic on a new paved highway.

Convinced that a location on the highway would be a good "business move," the town got up and moved over in its entirety, including its three business houses, all of which were frame structures.

Railroad Grade Crossing Eliminated

BY HOWARD C. MEANS Chief Engineer

It fortunately happens that the main lines of both the railways and highways in Utah are approximately parallel and that the problems of grade crossing eliminations are, for the most part, those of highway relocation. When the railroads came, following our historic highways through the mountain passes and taking from them their importance as a means of through travel, grade intersections were accepted as a permanent addition to the hazards of the highway. The elimination of numerous and often extremely dangerous crossings was more apt to be made by the railroad in seeking reduced gradients and easier curvature than by our road builders who sometimes acquired a respectable mileage of fine highway without effort by simply moving the traveled way to the abandoned track bed. In the populous portions of the state the service of local interests was the chief factor in the location of the highway. The directness and safety of the route so far as through traffic was concerned, required and received scant consideration.

For these reasons the question of eliminating railroad grade crossings as projects now proposed for construction come up for consideration, is frequently the subject of much discussion between the Utah state road commission and local interests who have looked upon the existing highway location as a permanent economic asset and who object to paying taxes for a new highway when such improvement they consider will cause their interests to sustain a loss. Certainly no criticism can attach to the viewpoint of people who see their immediate interests at stake, and so far as is practicable, through highways are located as as to give local interests and local traffic every possible advantage.

In accepting federal aid as a means of financing highway improvement the road commission has undertaken the obligation of building these roads where they will provide the greatest service and safety to the greatest number. The object of the federal government in cooperating in the expense of construction is to provide a system of inter-county and interstate roads. All the construction now being carried on by the commission is on this federal aid system and on the basis of 74% federal to 26% state funds. Judging by the past we can only guess at what may be the extent of automobile travel within the next ten years and it is presumed that the location of our through highways is now being made for all time.

It is the policy of the bureau of public roads to eliminate railroad grade crossings on the federal aid system wherever practicable. This policy has met with the hearty cooperation of the state highway departments throughout the country and by the public in general. When one realizes the number of killed and injured each year in grade crossing accidents he is quick to realize the soundness of this policy. Department of commerce statistics show that 8582 people were killed or injured at grade crossings in 1923. This represents an increase of 20 per cent over the number killed in 1922. At this same rate of increase it is estimated that 2800 persons will be killed and 8,000 injured during the year 1924. Every day of the year 7.6 persons will be killed and 21.8 persons injured, which is equivalent to one person killed every three hours day and night and one injured per hour.

It is estimated that in excess of one quarter of a million grade crossings on Class I railroads alone exist today and with an automobile for every seven persons in the country one realizes a great hazard exists. Just what can be done to reduce this hazard is a problem. The cost of separating the grades on a quarter of a million grade crossings is prohibitive and impossible of accomplishment only on a definite plan adopted and carried out persistently over several generations. What can be done though is to try to hold our own in this problem and when new highway construction is undertaken the grade crossings should be eliminated either by relocation or grade separation wherever practicable. Frequently we find that a relocation can be made and eliminate the grade crossings and at the same time shorten the highway.

In a majority of cases where elimination of grade crossings can be accomplished by relocation at the time construction is undertaken it can be accomplished at a much less cost than by a grade separation either by an underpass or an overhead. This plan is being followed by most of the highway departments of the country as the records of the bureau of public roads show that out of 753 grade crossings eliminated, 467, or 62 per cent of them were eliminated by relocation, and 286, or 38 per cent by grade separations. It is estimated by conservative engineers that grade separations will average about $75,000 in cost throughout the country. It is my opinion where it is possible at all to eliminate grade crossings by relocation it can be accomplished at much less than $75,000 per crossing.

In the last three years Utah has been doing whatever possible to eliminate grade crossings where they occur on new projects. This has been done both by relocation and separation but the much larger number by relocation.

The following are the number of crossings eliminated by relocation during the last three years:

F. A. P. No. 32, North Ogden-Hot Springs, Weber county, 2 crossings.

F. A. P. No. 41, Morgan-Peterson, Morgan county, 2 crossings.

F. A. P. No. 34-A, Spanish Fork-Payson, Utah county, 4 crossings.

F. A. P. No. 17-C, Levan-Chicken Creek dam, Juab county, 2 crossings.

F. A. P. No. 47-D, Fountain Green-Juab county line, Sanpete county, 2 crossings.

In addition to these eliminations we now have under contract the elimination

Near entrance to Zion Park

of the following by separation of grades:

F. A. P. No. 31, Riverdale viaduct by an overhead carrying the highway travel over the tracks of the Union Pacific railroad and the Weber river at Ogden.

F. A. P. No. 24-C, Price Underpass which carries the highway travel under the railroad tracks of the Denver & Rio Grande Western railroad at Price.

On the construction program to be undertaken during the present season and in the near future we are proposing to eliminate many grade crossings, among which are the following:

F. A. P. No. 60-A, Echo-Emory in Summit county, in which 7 grade crossings will be eliminated, six by relocation and one by an underpass, in eleven miles. Relocation from Emory to the Wyoming state line will eliminate four additional crossings.

F. A. P. No. 61-ABC, Salina-Richfield in Sevier county in which two crossings in the vicinity of Sigurd are proposed to be eliminated thereby shortening the highway by 1.6 miles.

F. A. P. No. 77, Richfield-Elsinore in Sevier county, in which two grade crossings are proposed for elimination, thereby shortening the highway to be traveled .7 of a mile.

F. A. P. No. 73, Spanish Fork-Soldier Summit in Utah county, in which it is proposed to eliminate 12 crossings, eleven by relocation and one by overhead.

Discussion often occurs on the question as to whether a highway will have sufficient travel to create much of a hazard if a grade crossing is built or whether the railroad train service over a grade crossing is of sufficient frequency to create a hazard. Certainly an element of danger exists in all grade crossings and I think it would be rather hard to find even a representative of the railroads who would say this danger is negligible. A different degree of hazard exists at all grade crossings and is determined by the travel both on the highway and the railroad. Travel on all highways will undoubtedly increase very rapidly and assuming the number of railroad trains passing over a grade crossng would remain the same for the next fifty years, the hazard would be increased in proportion to the auto travel. A proportionately greater degree of danger exists at branch line crossings where the train service is relatively infrequent as compared with that on main lines due to the fact that many more motorists will cross such tracks with a slackening of the care and caution they will observe at well-known danger points.

Use Calcium Chloride for Curing Concrete Roads

In a paper read a few weeks ago before the American Roadbuilders' association, H. F. Clemmer, engineer of materials of the Illinois division of highways, described an investigation conducted by the bureau of materials concerning the use of calcium chloride for reducing the period for curing concrete roads, under present methods, and also the various effects of the material upon the concrete.

He stated that it had generally been proven that "calcium chloride, when used in the proper amounts, does accelerate set and secure the same strength at the end of fourteen days as can be obtained from the use of the various wetting methods in twenty-eight days."

Concerning the theory of this, Mr. Clemmer said that, while the action of the chemical is dependent chiefly upon its hygroscopic properties and the resulting ability to attract moisture from the air, it is thought that, in attracting it from the concrete also, it produces minute capillary channels in the concrete, into which the calcium chloride is in turn drawn and so penetrates the concrete for a considerable depth. The tests demonstrated that this penetration took place within twelve hours.

Some have objected to the use of calcium chloride, under the belief that the surface of concrete that had been treated with it frequently scales and becomes mushy. The Illinois department has had experience in treating with calcium chloride over 1,000 miles of concrete pavement, and found no more serious cases of scaling on concrete cured with the chemical than on that cured with wet earth or ponding. In fact, investigation indicated that excess tamping or belting were the most serious causes of scaling.

Primary interest being concerned with the strength obtained in fourteen and twenty-eight-day periods, the greater number of specimens were tested at those ages; but others were tested at sixty days, ninety days, six months, one year and two years.

The tests consisted in determining the modulus of rupture of the various specimens tested. Tests were made on slabs 8 inches by 12 inches by 30 inches, pavement conditions being duplicated as closely as possible during seasoning. Some of the slabs received no treatment, some 2 inches of dirt wet for three days, others the same wet for seven days and still others wet for fourteen days, while other slabs received from one to three pounds of calcium chloride per square yard, applied after 10 hours and after 24 hours. Precautions were taken to eliminate personal equations and others common in cement testing laboratories.

These tests appeared to demonstrate that, when cured with calcium chloride, concrete reaches as great strength in fourteen days as it does in twenty-eight days when wet earth is used.

Tests were also made using concentrated solutions of calcium chloride instead of the dry chemical, but the latter was found to be far superior.

The author stated that the property of calcium chloride of "maintaining the moisture content of the concrete at a higher percentages during the first forty-eight hours leads to the belief that the chemical serves to prevent the formation of transverse cracks caused by shrinkage. General observation indicates that fewer transverse cracks occur in concrete pavements cured with calcium chloride than in those cured by ponding or wetted earth. This is being definitely investigated in Illinois at the present time."

Specimens that had been treated with a surface application of dry calcium chloride at a rate equivalent to 10 pounds per square yard of surface indicated slight puffing due to this excessive use of the chemical. It was noted, however, that the tensile strength of these briquettes at the age of 28 days was not affected by the excessive amount of chemical. Contractors are cautioned, however, against using excessive amounts and are instructed to break up all lumps and spread the material evenly.

Other tests were made to determine the rate of wear of surfaces that had been cured differently, two heavy weights being drawn in a circle by a revolving arm while standard abrasive material flowed at a uniform rate just in front of the weights. Under this test, a surface that had been treated with 2½ pounds of calcium chloride showed an almost imperceptible wear of .024 inch, while a surface which had not been so treated showed a wear of 0.2 inch under the same number of revolutions.

As a result of these favorable tests, the Illinois division of highways determined to permit the use of this material, and about three-quarters of the total mileage constructed in 1923 was cured in this manner. A general circular has been issued containing the following instructions for surface application of calcium chloride:

"Calcium chloride may be used in connection with curing of pavements, taking the place of the usual curing with earth and water, or the curing with water by what is known as the 'ponding method.' Two an done-half pounds of flaked or granulated material (the flaked is preferred as it is more easily distributed and less easily removed by wind or rain) shall be applied to each square yard of pavement and it shall be distributed uniformly over the surface of the finished pavement by means of a mechanical drilling device or by the use of shovels and long-handled brooms. The material shall not be spread upon the pavement until the latter has thoroughly set—ordinarily from 6 to 8 hours after laying the pavement. Care shall be taken that the material is uniformly spread and if, in the opinion of the engineer, a uniform distribution is not obtained from the shovels, a thorough brooming shall be required. All lumps shall be broken up and uniformly distributed over the surface.

"Calcium chloride shall not be applied during rain and experiments have definitely determined that if a rain follows the placing of the calcium chloride after a period of two or three hours there will have been enough absorption of the calcium chloride by the new pavement preceding the rain so that there will not be required additional applications of the material.

"Although the water line for curing of pavements with water may be omitted where central mixing plants are operated and calcium chloride is used in curing, nevertheless the general specifications with regard to wetting of subgrade and the general specifications with regard to placing of burlap on the freshly deposited concrete and wetting of burlap shall be strictly enforced. The use of calcium chloride for wetting the subgrade will not be permitted. When calcium chloride is used in curing, the sides of the concrete pavement shall be banked with earth as soon as the forms are removed."—Public Works.

Old and New Highway Bridges

By MAURICE HOUSECROFT, Chief Bridge Draftsman

Every motorist who can recall the ıys when the farmer threatened to take s shot gun in hand and chase the autos f the people's highways will remember so the number of rickety bridges that set his pathway. Sometimes the ructure was substantial and only the oorway flopped protestingly at his difdent advances or again it was a steel uss of "assembled design" that would act with more ominous squeaks and roans than a flivver on a quiet evening. nother treat that is denied the coming eneration is that of crossing an ultraexible suspension bridge with rusted ables and hangers, creaking like a thouand haunted towers in a gale, the floor oming to meet you like a crested wave s you advanced. It was quite a comıon thing, too, during the spring freshet nd high water seasons to be hurrying long as fast as the road would permit o an important engagement only to find hat the bridge that looked all right a ew days or perhaps a few hours ago, ıad quit its job entirely and you had he choice of turning back or waiting ıntil the waters receded.

A few such bridges remain in service n our principal highways and washouts nust in the nature of things now and hen delay us but our highway builders ıave been busy removing these experinces from the lives of the present genration and replacing the old structures vith graceful and permanent concrete rches that go well with any landscape, ıowever beautiful. The steel truss ridge, though the lines are not as apıealing, perhaps, as those of an arch ridge, has had just as much care and onsideration given to detail and design ıs is given to any other type of structure. The designer of a steel truss ridge does not, however, have such opportunity for individuality and consideraion of aesthetic features, for he has to ıse as economically as possible the secions rolled by our great steel mills. But ust the same, the steel bridge is a fine ample of the craftsman's art, for every ivet has to function, each joint must e firm, for, as has been said, a steel bridge is no stronger than its weakest connection.

The accompanying cut shows a proposed bridge over the Malad river in Box Elder county, Federal Aid Project No. 63-C. This structure is of a 'T'-Beam type with slab approach spans. Yet for a very small additional cost the graceful lines of a flat arch have been effected in the outlines of the two outside girders on the main span. A new structure over the Bear river in this vicinity will be of similar design, having four spans of the same type as the center span shown in the picture.

The practice in the past has been to furnish bridges with a maximum carrying capacity of about 10 tons, but with the ever-increasing loads on motor vehicles of today it is necessary for the state highway departments to provide structures strong enough to carry loads in excess of those in actual use, so that when highways are capable of accommodating heavy traffic the bridges will not be the limiting factors.

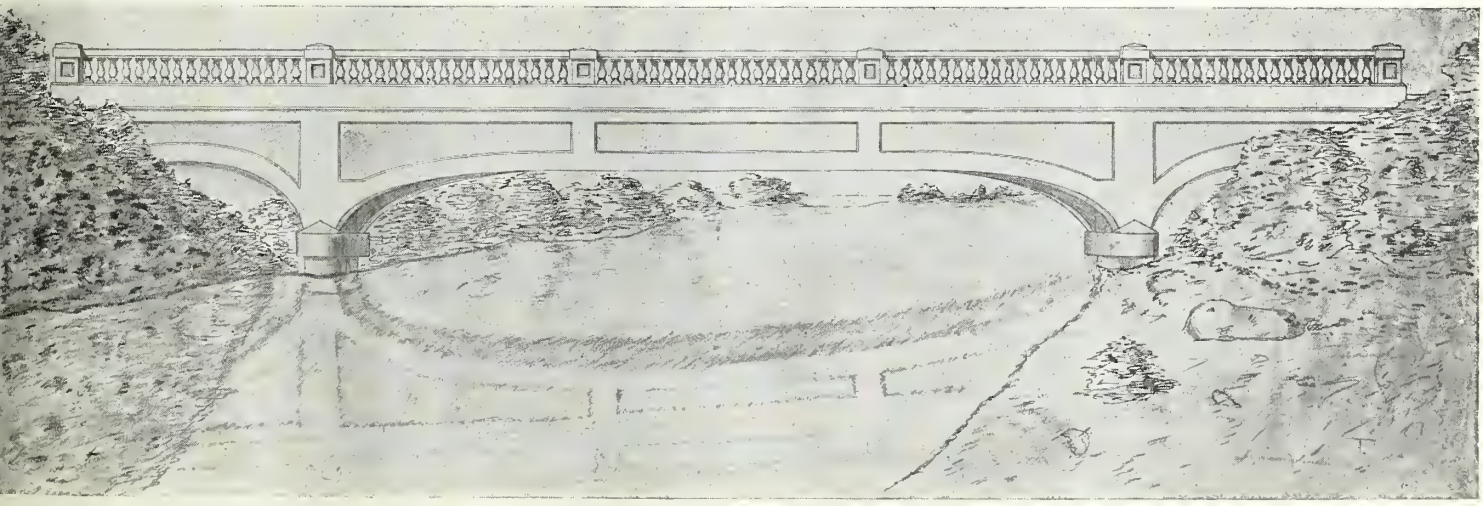
Experience has shown very clearly that trucks have under-rated capacities, for instance, a 5-ton truck will average about 10½ tons in total weight while 7½-ton trucks average 13½ tons total weight. Consequently it is clear that structures built today have to be designed for greater maximum loads if they are to serve these needs for any considerable period without being rendered obsolete on account of overloading.

A review of the various specifications in use by the states will reveal the necessity for standardization of design loadings; according to the bureau of public roads sixteen states still use Theodore Cooper's specifications of 1896, Class B-1, which were evolved at a time when there was no conception of the extent to which highway traffic would develop both in density and weight. Even in our western states there is a variation from one 15-ton truck to a 20-ton traction engine and two 18-ton trucks with 30% impact. Therefore to the layman traveling across the country he will pass over light bridges and then heavy bridges as he passes from state to state, with no appreciable change in the traffic requirements. At the present time there are national engineering organizations working toward the standardization of highway live loads, endeavoring to furnish a specification that will meet the requirements of today. If all states can adopt this design loading there will be an elimination of that unjustified variation.

There has been considerable criticism regarding the junction of the bridge floor and the highway which in many cases is justified, we all know that it is most unpleasant and annoying to drop into a chuck hole before you get onto a bridge and drop into another as soon as you leave, but a perfect connection between roadway and structure is very difficult to obtain, several types of joints have been designed and tried but the ideal joint has yet to be devised. On an unsurfaced highway the approach fill in spite of all human efforts is determined to settle and it appears that constant care and maintenance are the only means of preventing these objectionable and dangerous humps.

The above points are obvious to the everyday traveler and the public of today is highly educated along the lines of highway requirements, and everyone knows that a bridge opening has to have sufficient area to carry the maximum run-off and have foundation stout enough to withstand the strain imposed upon it, but these points being granted, there must be someone who shall say just how large the waterway shall be and be able to investigate foundation conditions, that only the necessary amount of public money be spent to meet the condition. Therefore, the bridge departments of our highway commissions are called upon to investigate the stream condition, the area to be drained, condition of drainage basin, for every change in country from wooded slopes to barren rocky regions have their effect on the velocity with which the drainage takes off. Then when the waterway has been

(Continued on Page 7)



Elevation of proposed 100-ft. bridge over Malad river, F. A. P. 63-C

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H. V. RICHARDS, Editor

COOPERATIVE MAINTENANCE WITH GAS TAX FUNDS

Very satisfactory progress is being made in placing the 3,000 miles of state highways under efficient maintenance on the cooperative plan recently proposed by the state, whereby each county matches on a "50-50" basis the funds allocated to it from the revenue derived by the state from the gasoline tax.

The state road mileage is divided, according to the plan outlined by the state, into five classes based upon the estimated costs per mile for satisfactory maintenance during the year. Two thousand miles of the system as rated as requiring an annual expenditure of $100 or more per mile, 380 miles being denoted as Class "A" and estimated to cost $200 per mile to maintain satisfactorily under present traffic. One thousand miles of comparatively light traffic road are included in the budget at $50 or less per mile of road.

It is required that each county deposit with the state treasurer only 25 per cent of its portion of the estimated maintenance expenditure for the year in order to put the maintenance program into effective operation, additional amounts to be requisitioned as the season advances, up to and not exceeding the total amount in the budget.

With only one or two exceptions all the counties have been able to date to accept the state's proposal and are otherwise rendering much assistance to the highway representatives, the state road agents, who are in charge of the maintenance operations in each county.

The patrol system in complete or partial operation in twelve counties, is to be extended, under the cooperative plan, to include every construction project when completed. This is working out very satisfactorily on gravel surface projects recently completed, the patrols going on immediately when the project is completed and the contractor released. Experience has amply demonstrated that there is but one way to properly conserve the public's investment in its gravel roads, built at a cost ranging from $6,000 to $20,000 per mile, and that is by efficient maintenance beginning as soon as the road is opened to traffic.

While the state is able to finance but half of the cost of maintaining the state highways this year—only about $150,000 having been made available from gas tax funds—the motor vehicle department estimates that not less than $350,000 will be available for use on the roads next year after meeting the fixed charges which are required by law to be paid out of this fund in the amortization of highway bonds before any sum can be expended for current use on the highways. With this encouraging prospect before us it is evident that the state can participate to a much greater extent in the financial burden of maintenance next year and perhaps relieve the counties entirely from financial responsibility. The prompt assistance of county commissioners in putting the maintenance program into successful operation is greatly appreciated by the state road commission; every effort is being put forth to assist the state in its endeavor to keep the through routes of travel in good repair and county equipment has been freely loaned as additional crews are placed on the roads. Cooperation of this kind on the part of these public spirited citizens throughout the state cannot fail to be reflected in the pronounced improvement of Utah highways this coming summer.

AMERICAN FORK CANYON

(See Cover Picture)

On this month's cover is shown "Hanging Rock" in American Fork canyon. This canyon is one of the deep and rugged clifts worn through the Wasatch range and into Salt Lake valley following the recession of the great ice field in past geologic ages. It is conspicuous among the impressive canyons of the Wasatch for the rugged grandeur of its sky-piercing summits, a succession of titanic peaks rearing above a jumbled strata, flinty points and crags of the boldest description. The mouth of the canyon is about seven miles southeast of the town of American Fork, which is on the paved state highway between Salt Lake City and Provo. On the southern side of the canyon is Mt. Timpanogos, a favorite of the devotees of mountain climbing, the highest peak in the Wasatch range, 12,000 feet elevation, and approached by two trails which pass through five different plant zones. Near the summit is a small glacier, the only one remaining in the state and which feeds at its base a small body of water—Emerald Lake. The mountain is now encircled by an auto road, Alpine Scenic drive, from the North Fork of the Provo in Provo canyon, to a point near the head of American Fork canyon. The road uncovers for motorists splendid mountain scenery from vantage points heretofore accessible only by much climbing. It is one of the links in a chain of highways which is to connect the fine principal canyons between Salt Lake and Provo by a summer road among the summits of the Wasatch.

Adding to the attraction of American Fork canyon is the Timpanogos Cave, discovered August, 1920, two miles from the mouth of American Fork canyon and 1200 feet up the mountain side from the highway station. The forest service has built a trail about a mile in length and on an average grade of 20 per cent to the entrance of the cave. This trail, winding among the rocky cliffs of the steep mountain side, is in itself well worth the effort of the climb on account of the panorama which is disclosed of mountains and forest, even without the wonderland in the cave at the end of the trail. The cave has been lighted by electricity; it has been set aside as a National Monument and guides provided by the forest service are busy throughout the summer directing visitors through the cave.

The following description of the cave is from the pen of J. Cecil Alter as published in the Salt Lake Tribune:

"The interior was as moist and exhilarating as a wine cellar is said to be, even when a cold drop gets inside the collar at the back. One's first contact with the stalactites is apt to be as hair-combers and back-scratchers where the cave wall overhangs, though a few inches to one side the ceiling is a vault to the very zenith, out of range of sight. Nearly the entire cave surface is thinly thatched with a macaroni-line filigree or a mass of vermicelli plastered to the walls, in pink, white and crystal forms. Someone suggested the resemblance to a great throat frosted over and congealed solid.

"While gazing up a satisfactory reproduction of the famous golden stairs, set with glass cauliflowers for newel posts and scintillating with scenery intensified by the electric lighting, the guide jarred us back into terra firma, actually, by reminding us of the muddy slippery stairs ahead due to a drip. Sugar candy-line forms made the golden stairs to the gallery appear to be a kiddy heaven sure enough. Frosty feather boas and wreaths trimmed the ceilings in places as if to suggest that the stairs led to a warmer region where such apparel was not needed. Fine coral forms betoken purity and perfection of the designs. Here and there the veneer of beauty has fallen away, by its weight perhaps, revealing mother earth's bare shoulders of rugged rocks. Handholds of ivory and glass indicated the route here and there, though warning signs contradicted with 'Hands Off.'

"But the story of the birth, growth, maturity and decay of the floor of stalagmites, and their ceiling companions, the

stalactites, is told to the visitor as on the printed page. A tiny tongue grows from the ceiling, as many are now starting, the drippings from which erect a counterpart on the floor plumb beneath. If the distance be but a foot or so, as it is on many ledges, and in many cavern edges, these tiny swains of nature reach out for but a few years before finally clasping hands, that is a comparatively few years."

LOW BIDS FOR ROAD WORK

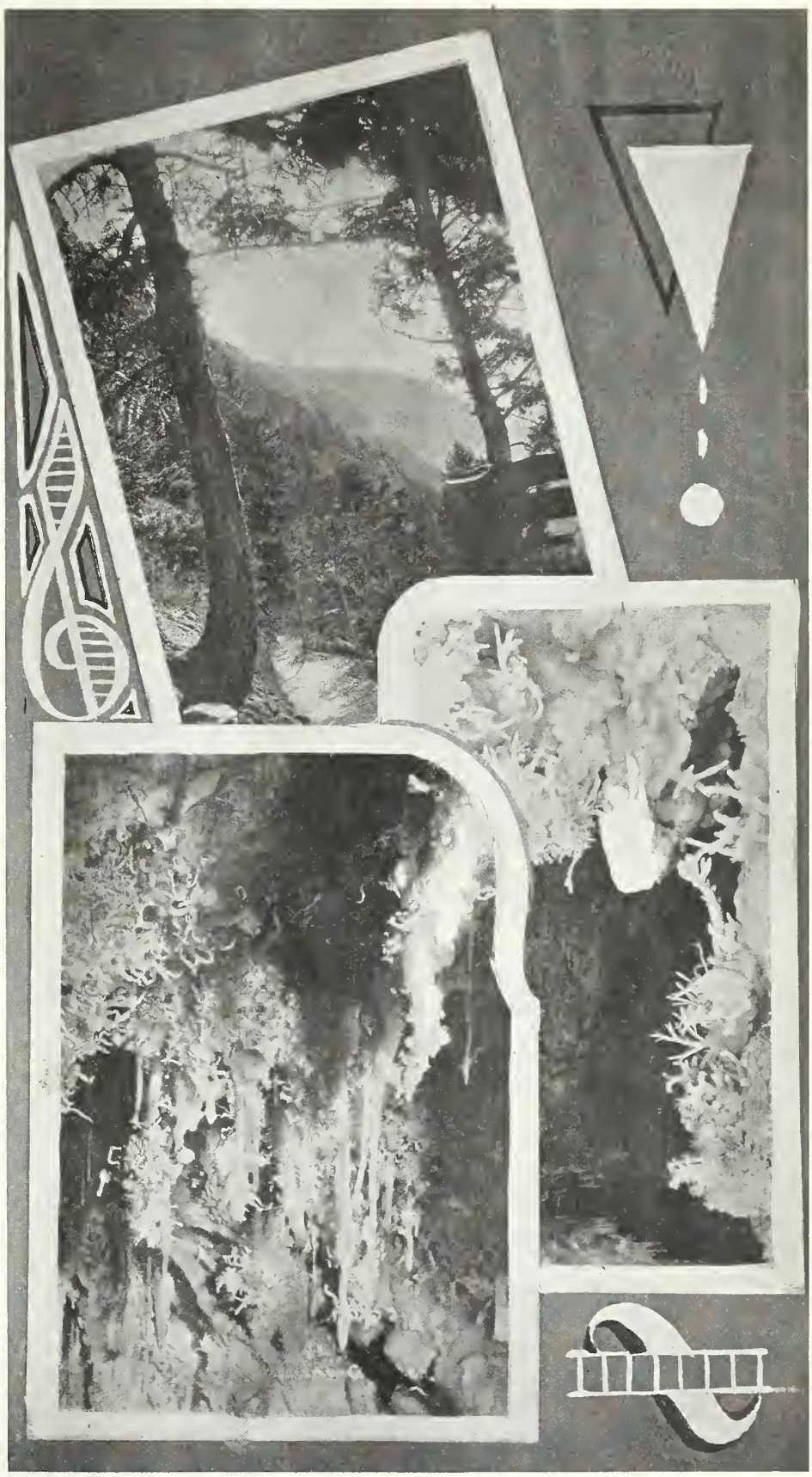
Highway contractors began the construction season of 1923 by bidding too low. The sad experience of loss, or at least of no profit, from their operations, it would seem, should have warned them against repeating the error. Yet there are clear indications that the old urge "to get in on the first letting" is creating a disposition again to take chances on prices for which there is no sound reason. With quite as much road construction in prospect as there was in 1923, will contractors again underbid their opportunity? They have no one but themselves to blame if they do. The sacrifice of contractors to construct improved roads is required by no one. Indeed state highway administrations are, as far as they may, sounding a warning against contractors offering themselves as a sacrifice. Last week in addressing the New York Highway Contractors' association, Frederick Stuart Greene, state superintendent of public works, announced that the state this year would let contracts in the amount of some $30,000,000 and expressed the hope that "the contractors would make money." He urged against bids too low for a profit. He said: "You bid 75c a cubic yard for excavation, and it cannot be done at that figure. The state engineers estimate $1.25 a cubic yard. It can be done for $1 a cubic yard at a small profit, but the extra 25c gives the contractor some leeway." Privately other state highway engineers, it is known, have given similar warnings. There may be exceptions, but, by and large, it is contractors and no one else who are responsible for the underpricing of road work. Theirs is the duty to reform the practice.—Engineering News-Record.

Old and New Highway Bridges

(Continued from Page 5)

determined it is necessary to know what local material can be used to produce the finished bridge for the least cost; for instance, it would be disastrous to attempt to build a big concrete structure where sand and gravel were scarce and hardly any water during the dry season with a comparative long haul for the cement, therefore it can be seen that local conditions control the type. The type having been determined the detail plans and specifications are prepared by men specially trained for this particular branch of the profession.

The contract is then awarded and once more we see the what was once a dream and only a mind picture take on tangible lines and become a reality. However, it is necessary that inspectors and engineers be trained to supervise the construction and safeguard the public interest to see that only the best possible materials are used in the construction,—then in course of time, depending considerably on whether a cloud burst fills in the excavation with debris or takes out the falsework and drops the superstructure into the river,—we creep on to completion. At last, all the forms are stripped, a little rubbing here, a little patching there, and the bridge and approaches are finally completed, and there, to serve you day or night, rain or shine, in Pierce or Ford is just—"a bridge."



Forest trail to Timpanogos Cave and views inside the cave

SPARKS from the Road Drag

Housecroft—"What's a fairy tale?"
Tommy—"That depends on which way the ferry's going."

* * *

Climbing Crocodiles

"Your Honor, I was not intoxicated."
"But the officer says you were trying to drive your car up a lamp post."
"I was, your Honor. A couple of crocodiles had been following me around and I don't mind telling you how they were getting on my nerves."—Motor Age.

* * *

Mother—"Jessie, the next time you hurt that kitty, I am going to do the same thing to you. If you slap it, I'll slap you; if you pull its ears, I'll pull yours; if you pinch it, I'll pinch you. There now."
Jessie (after a moment's thought)—"Mamma, what'll you do if I pull its tail?"

* * *

The Girl: "Did I ever show you where I was tatooed?"
The Boy: "No."
The Girl: "Well, we can drive around that way."—Brown Jug.

* * *

Cheap Enough

"I followed him for six blocks at 50 miles an hour, your honor. He cut two corners, turned four times without signaling, knocked down a traffic stand, crossed four intersections without slowing up, and parked headed the wrong way when he got to the Union Station."
"My mother-in-law was leaving us, your honor, and I only had 15 minutes to make the train. If she missed it, she was going to stay another week."
"Did she catch the train?"
"Yes, sir."
"Every rose has its thorn. $100 or 30 days."

* * *

Magic Draught

"He ran up on the sidewalk, your honor, knocked the patrol box down, kept on through the windshield and hid his head in a trash box. It was a brand new one, and we spoiled it prying him loose. He was the drunkest man I've arrestsed this year."
"I had my last drink six months ago, your honor."
"Marvelous! $125."

* * *

No, Not One

"All right back there?" called the conductor from the front end of the bus. "Hold on," cried a feminine voice, "wait until I get my clothes on." No one turned around to see a girl get on with a basketful of laundry.

Hot Dog!

The joy that surpasseth all understanding is the thrill that comes to a Ford owner when he buys a real horn and sees a Rolls Royce get out of his way.—Tappet.

* * *

Nobody Home

"Where is the car?" demanded Mrs. Diggs.
"Dear me!" ejaculated the professor, "Did I take the car out?"
"You certainly did. You drove it to town."
"How odd! I remember now that after I got out I turned around to thank the gentleman who gave me the lift and wondered where he had gone."—American Legion Weekly.

* * *

Right

What many automobiles need is not four-wheel brakes, but fore-sighted drivers.—Omaha Bee.

* * *

Concerning Mr. Klegg

A lucky guy
Was old man Klegg.
Who had an ar-
Tificial leg.
For when that limb
Was smashed for fair,
He simply bought
Another spare.

* * *

Was Polite, Anyhow

A green skinner on a road job at Riverdale drove up on the dump with a load of dirt.
"Hi!" said the dump man at the proper moment.
The skinner looked around in surprise, "Good morning!" he said and drove on.

* * *

Irish and Red Headed

A contemporary relates that a red headed Irish boy once applied for a position in a messenger office. The manager, after hiring him, sent him on an errand in one of the most fashionable districts. Half an hour later the manager was called to the phone and the following conversation took place:
"Have you a red headed boy working for you?"
"Yes."
"Well, this is the janitor at the Oakland apartments, where your boy came to deliver a message. He insisted on coming in the front way and was so persistent that I was forced to draw a gun."
"Good heavens! You didn't shoot him, did you?"
"No, but I want my gun back."

Where does the West begin—
Out where the Fords are a little thicker
Out where wood alcohol is liquor,
That's where the West begins.

Where does the East begin—
Back where the neck is a little trimmer
Back where the eye is a trifle dimmer—
That's where the East begins.

Where does the West begin—
Out where the vests are a little louder
Out where the air has a smell of powder
That's where the West begins.

Where does the East begin—
Back where the men have a girlish figger,
Back where the wives pull a hairset trigger—
That's where the East begins.

OH, THE GOSH DARN WEST
AND THE GOSH DARN EAST
BOTH SWOLE UP LIKE A TUB OF YEAST;
WOULDN'T WANTA LIVE,
WOULDN'T WANTA DIE
ANYWHERE BUT HERE—
I'M A UTAH GUY!!!

* * *

Muir—"Who is she?"
Dick—"She's Helen Carrs."
Muir—"How is she in a porch swing?"

* * *

Couldn't Hold It!

There's one particularly fast train on the Kentucky division of the Illinois Central which is commonly called the "High Stepper." It stops only at carefully selected points. The agent at a small station noticed a pink-jowled stranger with two large grips in convoy waiting on the platform about an hour before the local passenger train was due. Up at the far end of the platform stood a truck loaded with empty milk cans ready for the local. A little while afterward the "High Stepper" rambled through, making merely a crash and an echo. But mingled with the echo was the clatter of tumbling milk cans and other untoward sounds.
The agent hurried outside and saw the stranger extricating himself from a pile of debris. "Good Lord!" the agent exclaimed, addressing a small boy who stood watching the proceedings, "did that man try to catch the fast train?"
"Why, yes," said the boy, "he did catch her, too, but he couldn't hold her. She got away."

* * *

Questions and Answers Column

What makes a dog spotted? Spots.
What is the next thing to man? His shirt.
What has no beginning and no end? A doughnut.
Where would you prefer a boil? In the teakettle.
What is the best thing out for real comfort? An aching tooth.
What is the best thing to put into mincemeat pie? Your teeth.
What does an elephant have that no other animal has? Baby elephants.
If 32 is freezing point, what is squeezing point? Two in the shade.
What makes the street cars so crowded in Chicago? The passengers.

The Improved Highway and Its Relation to Human Advancement

Go through, go through the gates; prepare ye the way of the people; cast up, cast up the highway; gather out the stones; lift up a standard for the people. —Isaiah 62,10.

It is not inappropriate to quote the inspired writer's command, "cast up the highway, gather out the stones, lift up a standard for the people," as peculiarly applicable to the building of highways today; for in the construction of highways the low places must be cast up, or built up, the stones must be cleared from the road, and a standard must be uplifted for the people.

The standard which good roads means is a standard of higher living, of economic advancement, of moral and spiritual and educational growth. Within the last few years there has been a nation-wide awakening to the desirability of good roads, impressed with an ever increasing force upon the minds of people by reason of the amazing development of the automobile and the motor truck. With slightly over 81 per cent of the number of automobiles in the entire world, this country is testing out as no other country ever has done the tremendous economic power of the automobile and the motor truck. And the economic development of the nation which is now under way, and which we are to see in ever increasing growth, is to be influenced very largely by the highways on which the automobile can run with safety.

No longer regarded as a luxury, but as a prime necessity in economic life, the automobile and the motor truck are saving the country from a complete breakdown of all business. The annual investment in automobiles and motor trucks and in their direct maintenance is three or four times as great as the annual investment in railroad expansion and betterments. The progress made by the automobile and motor truck within the first fifteen or twenty years after the building of the first railroad in capital invested and in influence for good, the money expended and the influence created within the first fifteen or twenty years after the building of the first railroad.

The volume of traffic that is now being handled through the influence of the internal combustion engine has saved the country from a complete breakdown of its transportation facilities. It has recently been estimated, for instance, that about 100,000 automobiles from other states annually enter Florida, carrying into that state somewhere from 300,000 to 400,000 people. It would be physically impossible for existing railroads with their present facilities to add to the passenger traffic which they now have into Florida such a vast number of people as those who go by automobiles.

The automobile has created new prosperity in Florida which is steadily expanding the volume of traffic on the railroads of that state. Without the automobile this traffic would not have been developed for years to come to the point already reached.

Florida is only typical of what is going on in other states. It was among the first of the states to appreciate the value of good highways and to build them on a basis which twelve or fifteen years ago was considered equal to the traffic they would have to carry. But the roads then built are wholly inadequate to the present traffic. That state, like others, is being compelled to better existing highways by widening them and rebuilding them; and this movement must go on from year to year not only in Florida, but in every other state in the Union.

The road that is almost impassable in summer for deep sand, or impassable in winter for bottomless mud, can no longer be endured by civilized people. It is an economic monstrosity which halts the material and the educational advancement of any community. The good highway, on the contrary, lifts the people out of the ruts in education, in religious activity, and in material progress. The highway is a mighty economic factor, so great in its influence for good as to exceed the most enthusiastic commendation that has ever been accorded it.

Wherever a good highway is built in a settled country it has immediately given to the people of that region better opportunities for the development of home life, school and church attendance, moral and spiritual advancement and economic progress. The farmer living along a bad highway finds it well nigh impossible, except at a profit-destroying cost, to haul his produce to market, or to haul back from the city the things which he has to buy. An exorbitant railroad freight rate is no more destructive of business prosperity and progress than is a bad highway.

Railroad freight rates, however low they might be made, cannot have so great a stimulating power for good in the upbuilding of the country districts as a good highway.

Well may the prophet of old have emphasized the need of building up the highways and lifting high a standard for the people. City inhabitants have long had the benefit of paved streets, with the advantages which make possible easy traveling from one part of the city to the other under any conditions of weather; for even a heavy snow-storm is in these modern days quickly cleared from city streets. But the people of the country districts have been forced during much of the time to remain at home, or else to reach schools, and churches and markets under the handicap of almost impassable roads.

It is the bounden duty of every state to build and maintain highways; to build them so solid, so strong, that they will stand the increasing traffic of the coming years, and to guard these highways and maintain them in good order just as carefully as railroads are compelled to protect the maintenance of way and see that their track and roadbed are kept in safe condition.

We have entered upon an entirely new economic era under the influence of the internal combustion engine, greater in its effect upon humanity and upon the upbuilding of the country than was the inauguration of the railroad building era. The time has passed when railroad people should feel any hostility to motor trucks and automobiles. If the volume of traffic handled by these vehicles was now thrown upon the railroads they would completely collapse physically and there is no possibility within human sight by which the railroads can expand their facilities quite as rapidly during

Brigham-Corinne concrete highway, F. A. P. 38-A

the next few years as the business of the country will demand.

The highway comes, therefore, to supplement, and in some places to supplant railroads; for in many cases and for many purposes the automobile and the motor truck are as much in advance of railroads as railroads were in advance of the old stage coach. It is not at all probable that the utilization of improved highways by motor trucks and automobiles will ever wipe out of existence the railroads as the railroads wiped out the old stage coaches and their invested capital but good highways and automobiles will in some cases make unnecessary additional railroad expansions where the traffic can be carried to better advantage over highways by motor trucks. The railroad has its own field in which it must continue pre-eminent; but the highway, and the motor truck, and the automobile have their fields just as vital to the welfare of the country as are the railroads.

We are spending vast sums upon building better roads, but still larger sums must be spent, and will be spent, in carrying forward a movement fraught with such tremendous importance to the material, the moral, the educational, and the spiritual advancement of the people. The automobile brings the people of all sections into closer touch than the railroads could ever have done.

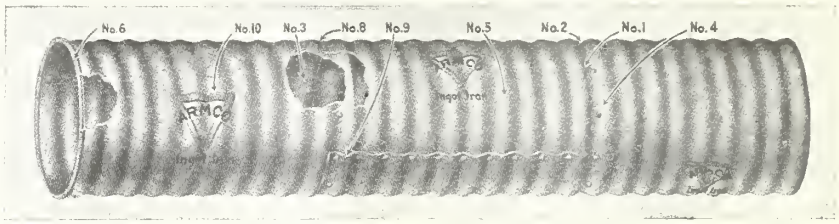
Long prior to the Civil war farseeing statesmen of South Carolina, dreading the possibility of a war between the sections, thought that it could be averted if a railroad could be built from Charleston to Cincinnati. They had in mind not only the economic development which would follow by turning the tide of business from the west through a southern port, but they also felt that the acquaintanceship which would thus be brought about through this business association of the south and the west would make impossible any sectional war.

South Carolina expended more than a million dollars on that projected railroad but it was too great an undertaking for those days. Long after the close of the war great railroad builders tackled the proposition and tried to carry it through; but there were many failures in such a vast enterprise before the people who finally succeeded in building the Clinchfield really were able to see fulfilled the ambitious dreams of South Carolina statesmen before the Civil war.

What those statesmen hoped to accomplish in the way of business and in the closer affiliation of the people of the south and west will be more than achieved by the automobile for the people from the north, the south, the east and the west as they are brought into closer personal contact, into social and business relations, by means of good highways and the automobile. The need for this is as great today as it was before the Civil war. There is not now in sight any cloud upon the horizon that suggests any sectional division or any war between the states; but there is an unrest and a turmoil, and at times a spirit of criticism between the different states and different sections that bodes not well for the nation.

This condition can be largely overcome, and is being overcome, by the power of the highway which connects state with state; and as these highways are extended and people find it feasible with an unbroken stretch of good road to motor from one section to another for business or for pleasure, the country will be welded into a more homogeneous sentiment, and the danger of sectional disputes and of class divisions will become less and less; for the automobile is no longer the toy of the rich; it is the business and pleasure vehicle which gives to the poor man, or the man of moderate means, opportunities of enjoyment for himself and his family and opportunities for business equally as great as those afforded the rich man.

Then on with the building of highways!—Manufacturers Record.



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2. The rivets of Armco Ingot Iron, closely spaced and properly driven.
3. The rivets always properly upset—never crushed between the plates.
4. The pipe is straight and even—joints cannot be loosened by bending or swaying.
5. Maximum quantity and quality of galvanizing—two ounces to the square foot.
6. The rodded end—preventing bruising of the exposed edge, and giving strength and a finished appearance.
7. Coupling devices provided where sections of the pipe must be jointed in the field.
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Status of Federal Aid Projects

By F. S. THOMPSON, Chief Draftsman

UNDER CONSTRUCTION APRIL 30, 1924

No.	County	Name	Type	Lgth.	Per Ct. Comp.	Contractor	Estimated Cost
4-F	Emery	Castle Dale-Ferron	Gravel	11.5	99	J. T. Raleigh Co.	$114,765.24
4-H	Emery	Rochester-Flat Bridge	Steel	75 ft.	30	J. T. Raleigh Co.	10,531.53
6-ABC	Grand-San Juan	Moab-LaSal Junction	Earth	23.25	97	Hyde & Black	372.423.13
9-A	Millard	Delta-Holden	Gravel	10.61	100	Johnson, Gillespie & Adamson	114,044.59
10-B	Uintah	Ft. Duchesne-Vernal	Gravel	3.19	47	A. G. Young & Co.	
10-C	Uintah	Ft. Duchesne-Vernal	Gravel	(1.31)	45	A. G. Young & Co.	69,596.17
10-B	Uintah	Bridges for above	Wooden	4 Br.	58	Caldwell, Batty & Eaton	
12-A	Washington	Ash Creek-Anderson's	Gravel	7.30	100	McArthur, Winsor & Whitehead	90,873.54
17-A	Millard	Scipio-Juab	Gravel	7.08	95	Hawley, Anderson & Hinkley	48,288.16
17-B	Juab	Chicken Creek, Millard Co.	Gravel	13.87	16	Hawley, Anderson & Hinkley	93,686.67
17-C	Juab	Levan-Chicken Creek	Gravel	9.04	100	Paxton, Dorrity & Black	73,627.34
24-C	Carbon	Price City	Concrete	1.12	6	Utah Concrete & Stucco Co.	76,839.69
31-A	Weber	Riverdale Overhead	Gravel	0.5	60	Union Construction Co.	43,072.63
31-B	Weber	Bridge for above	Steel	144 ft.	30	J. J. Burke Co.	43,974.86
33	Cache	Sardine Canyon	Gravel	6.96	70	Olaf Nelson	114,448.37
39	Salt Lake	Magna-Tooele Co. line	Concrete	6.41	79	Moran Paving Co.	210,674.70
42-A	Wasatch	Heber-Hailstone	Gravel	7.46	54	Gilkerson Const. Co.	68,904.85
42-B	Wasatch	Hailstone bridge	Steel	63 ft.	99	Christensen, Jacob & Gardner	21,682.61
43	Sevier	Richfield South	Concrete	1.5	21	Gray & Murdock	62,569.52
46	Rich	Woodruff-Wyoming	Gravel	7.4	75	Kroft & Bundy	51,537.00
47-A	Sanpete	Moroni City	Concrete	1.0	97	Reynolds Ely Co.	39,237.73
47-B	Sanpete	Moroni-Fountain Green	Gravel	7.09	93	Reynolds Ely Co.	53,298.19
47-C	Sanpete	Fountain Green	Concrete	1.0	....	Reynolds Ely Co.	32,774.95
47-D	Sanpete	Fountain Green-Juab Co.	Gravel	5.33	72	Reynolds Ely Co.	45,064.48
49	Summit	Gogorza-Salt Lake Co.	Gravel	3.06	41	Moss, Snarr & Thayne	40,448.27
50	Utah	Payson-Juab Co.	Concrete	8.56	14	Wasatch Grading Co.	261,464.68
51-A	Tooele	Knolls-Wendover (Salt Sec.)	Earth	6.06	53	N. E. Lamus	66,120.00
51-A	Tooele	Knolls-Wendover	Gravel	39.55	16	Kroft, Bundy, Zimmer & Lamus	280,000.00
52	Sevier	Salina-Redmond	Concrete	3.0	47	Gray & Murdock	96,288.13
53	Juab	Nephi City	Concrete	1.77	65	Wasatch Grading Co.	36,070.43
54	Iron	Cedar-Kanarra	Gravel	12.01	5	J. T. Raleigh Co.	110,427.19
56	Sevier	Redmond-Sanpete Co.	Gravel	2.13	0	Reynolds-Ely Co.	14,267.91
57	Sanpete	Gunnison City	Concrete	1.11	0	Reynolds-Ely Co.	42,068.70
57	Sanpete	Gunnison-Sevier Co.	Gravel	10.31	0	Reynolds-Ely Co.	93,141.82
58	Box Elder	Cache-Mantua	Gravel	4.14	17	Wheelwright Construction Co.	84,078.83

Projects for which Plans have been Submitted

No.	County	Name	Type	Length
19B	Piute	Junction-Red Bridge	Gravel	4.5 Mi.
55A	Washington	Iron Co. Line-Ash Creek	Gravel	8.0 Mi.
59	Davis	Layton-Clearfield	Hard Surface	4.11 Mi.
60A	Summit	Echo-Emery	Gravel	11.0 Mi.
66A	Iron	Parowan-Winn Hollow	Gravel	9.6 Mi.
67	Millard	Scipio-Holden	Gravel	12.0 Mi.

Plans in Course of Preparation

7A	San Juan	La Sal Junction-Wilson Wash	Gravel	7.0 Mi.
61ABC	Sevier	Salina-Richfield	Gravel	18.0 Mi.
63A	Box Elder	Chase-Bear River City	Gravel	6.0 Mi.
63B	Box Elder	Bear River Bridge		300 Ft.
63C	Box Elder	Malad River Bridge		100 Ft.
65A	Utah	Orem-Wasatch Co. Line	Gravel	9.5 Mi.
70	Juab	Nephi-Levan	Gravel	9.0 Mi.
71	Uintah	Uintah River Bridge	Steel	100 Ft.
72A	Sanpete	Fairview-Mt. Pleasant	Gravel	5.0 Mi.

Surveys Completed

19D	Piute	Red Bridge-Garfield County	Gravel	3.5 Mi.
51B	Tooele	Timpie-Knolls	Gravel	35.0 Mi.
64A	Piute	Marysvale-Sevier	Gravel	4.9 Mi.
73A	Utah	Springville-Soldier Summit	Gravel	30.0 Mi.

Proposed New Work

68A	Millard	Dog Valley-Cove Fort	Gravel	6.0 Mi.
68B	Millard	Dog Valley-Kanosh	Gravel	6.0 Mi.
69	Iron	Parowan-Buckhorn	Gravel	14.0 Mi.
98A	Beaver	Wildcat-Millard	Gravel	6.0 Mi.
98B	Millard	Cove Fort-Beaver Co. Line	Gravel	3.0 Mi.

Projects Being Advertised

67	Millard	Scipio Holden	Gravel	12.04 Mi.

Bids were opened May 20 for the construction of the Scipio-Holden road in Millard county.

The firm of Hawley, Anderson and Hinckley of Scipio were the low bidders with a total of $85,823.99, which includes state's cost of materials and a ten per cent allowance for engineering and contingencies.

The contract for this work will no doubt be let to them at the next meeting of the state road commission so that construction can begin immediately.

GOOD PROGRESS ON WENDOVER ROAD

Construction work on the Wendover-Knolls road in Tooele county is progressing rapidly. Up to the present time all grading on the salt and mud flat sections has been done by two giant trenching machines which have worked double shifts throwing up the grade. Grading of 14 miles of the 40 miles project has been completed by these methods. Work has commenced on three other sections where the soil has dried enough to make the use of team outfits possible.

The construction of the salt and mud flat section is no doubt the most difficult and very likely the most unusual piece of road construction accomplished in this state and the completion of this section will mean rapid completion of the remainder of the work which in-

cludes gravel surfacing throughout. Under the present plans of construction the contractors hope to have the entire project complete by September 15. In the meantime it is urgently requested that all hotels, garages and service stations will warn all tourists and motorists that the Wendover cut-off road is closed to traffic.

STATE TO COMPLETE ROAD AT HEAD OF PARLEY'S CANYON

At the request of the contractors and bonding company the state has taken over the work of completing the Moss, Snarr and Thayne contract between Gogorza and Salt Lake county, F. A. P. No. 49. The contractors failed last summer to prosecute the work in a satisfactory manner and their bondsmen were called upon to finish the contract. The bonding company has been unable to obtain a satisfactory subcontract for the amount of work to be completed and has requested the state to finish the construction. The commission has placed Lewis R. Fife in charge of this work and every effort will be made to complete this road within the next six weeks.

ASPHALT SURFACING IN VERNAL TO START

W. H. Varley, resident engineer in charge of the construction of F. A. P. No. 10A, near Vernal, reports that the laying of the native asphalt surfacing on this contract will commence the latter part of this month. All preliminary crushing of rock and hauling of the asphalt rock will soon be completed and everything will be ready for the mixing and placing of the finished product.

This is the first section of state highway which is to be surfaced with native asphalt and its completion is being watched with much interest.

ROCKVILLE BRIDGE TO BE BUILT

After considerable delay the latest reports state that Director Mather of the National Park service has directed that the contract for the construction of a bridge over the Virgin river near Rockville be let and the construction begun at once.

Negotiations have been in progress for the past few months. The park service at first sought assurance that the road connecting up the bridge would be built soon and finally agreed that if this connection was placed upon the federal aid system they would be justified in going ahead with the construction. The Utah state road commission requested the placing of their part of the connection on the seven per cent system but Arizona failed to recommend the link between Big Plains and Fredonia, which of course held up approval of the Utah portion of the road.

No doubt Director Mather has received assurances to justify his approval of the bridge construction.

Automobile dealer losses in the purchase and sale of used automobiles for 1923 totaled $57,347,000. These figures are announced by the National Automobile Dealers' association. The losses for 1923 were $66,304,200 less than the total losses for 1922.

Final Costs on Two Federal Aid Projects

The accounting department reports final figures on two federal aid projects completed near the close of the 1923 construction season. F. A. P. 41, a gravel surface project 7.8 miles long, was abandoned by the contractor and subcontractors, the job being completed by the bonding company. F. A. P. 48, a 75-foot steel span on cement rubble masonry abutments, was constructed across Coal creek, immediately north of Cedar City on the Zion Park highway.

F. A. P. No. 48, Coal Creek Bridge, Iron County

RECEIPTS

Received from Iron county	$ 8,147.10	
Received from government	21,644.02	
Total received on project		$29,791.12

DISBURSEMENTS

Cost of construction	$19,611.10	
Cost of structural steel	5,959.37	
Cost of other materials	2,271.06	
Cost of construction, engineering and inspection	1,407.15	
Cost of preliminary engineering	542.44	
Total cost of project		$29,791.12

F. A. P. No. 41, Morgan-Peterson, Morgan County

RECEIPTS

Received from government	$50,134.65
State road bonds (1921)	11,438.69
Morgan county	4,566.89
	$66,140.23

DISBURSEMENTS

Cost of construction labor	$56,644.45
Cost of materials	5,117.88
Cost of construction, engineering and inspection	5,987.21
Cost of preliminary engineering	1,098.13
Total cost of project	$68,847.67
Materials turned over to county:	
1142 pounds steel	50.56
Total disbursements	$68,898.23
Overdraft due from Morgan Co. (due state revolving fund)	$ 2,758.00
Cost to Morgan Co.	$18,763.58

County paid	$ 4,566.89	
State road bonds	11,438.69	
State rev. fund	2,758.00	$18,763.58

Comparison Made in Road Building

Delving into the annals of ancient highway construction, one is amazed at the amount of time and effort that was expended upon such work. The Appian Way, for instance, longest and best-known of famous Roman roads, was the result of four centuries of grueling work done by thousands of slaves used solely for that purpose. Work was begun on this historical highway in 312 B. C. during the reign of Appius Claudius Caecus and in the year 100 A. D., after a lapse of four hundred years, ancient records show it was still in the process of construction.

This famous roadway extends from Rome to Brindisi, a distance of 350 miles, and is from 14 to 18 feet wide. Ostensibly it was built to facilitate the movement of troops and army supplies during war times, but, as a matter of fact, it really proved of greater value as an artery of commerce.

The material used in its construction consisted mainly of squared stones which were hauled from the quarry in clumsy wooden carts drawn by teams of oxen. The stones were laid by hand on a specially hard and durable foundation.

Considerable credit has been given to the builders of what seems to be an indestructible road, and they are undoubtedly deserving of the praise, but various writers seem to have forgotten that the frost with which American road engineers are compelled to cope is unknown in the sunny clime of the Roman road district. However, even though the frost factor were eliminated, it would obviously be impractical to expend a whole year in hand inlay construction upon one mile of roadway. The expense would not warrant it and, what is more, traffic of late years has increased so tremendously that were it not for the extraordinary character of the development in highway machinery and the efficient methods of road building which have made it possible for contractors to lay a mile of concrete road in from ten to fifteen days, highway congestion and detours would result in a regular riot.—Contractors' & Engineers' Monthly.

AUTOS CHEAPER THAN WHISKY

It is common to wonder where the people get all their money to buy and run automobiles. A statistician comes forward with a statement that we are spending less money for, and on automobiles in this country than we used to spend for whisky. Which speaks well for the people. Automobiles are responsible for a lot of accidents, of course, but whisky used to wreck more lives and more homes in a week than autos would in a generation.

With Standard Oil setting the example, fifteen great corporations have agreed to discontinue roadside advertising that disfigures landscapes. Manufacturers of tires, automobiles, soap, flour, motor parts, oil, yeasts and products are included among the corporations that will discontinue disfiguring the landscape with billboard advertising. This is more than a concession to public opinion and good taste; it is also good business. Roadside advertising is wasteful advertising. — Brisbane in Hearst papers.

Old motor truck tires may find a new use if experiments being made with rubber paving blocks prove successful. A section of the new paving is being laid on one of the most traveled streets in Akron, following two years of experiment in this work.

When the "Light Traffic" Argument Fails

Just the other day, a man in this community said:

"The traffic out this way is too light to justify a Concrete Road."

The answer to this is that any improved highway increases traffic. Frequently it changes light traffic into heavy traffic almost overnight.

That is why it always pays in the end to build Concrete Roads—the roads that stand up indefinitely under the heaviest traffic, practically without repairs.

* * *

The Portland Cement Association has a personal service to offer individuals and communities. This service is designed to give you more for your money—whether you use Concrete or have it used for you.

Our booklet R-3 tells many interesting things about Concrete Roads. Write this office for your copy.

PORTLAND CEMENT ASSOCIATION

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A National Organization to Improve and Extend the Uses of Concrete

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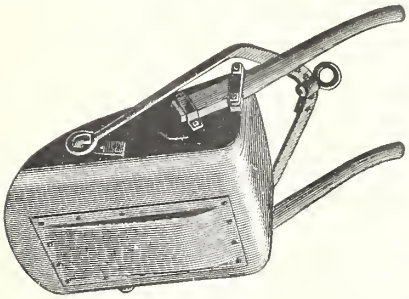

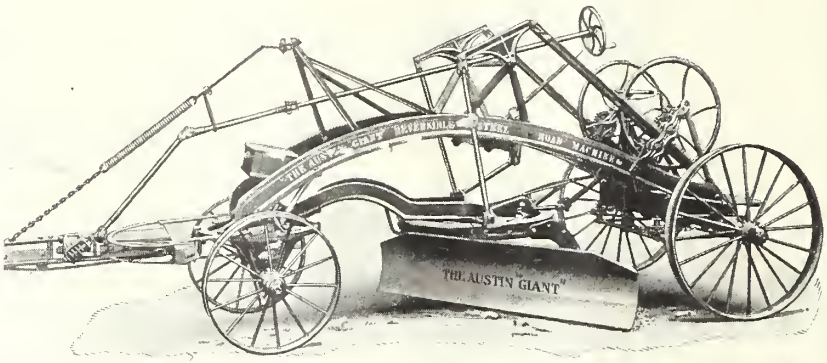

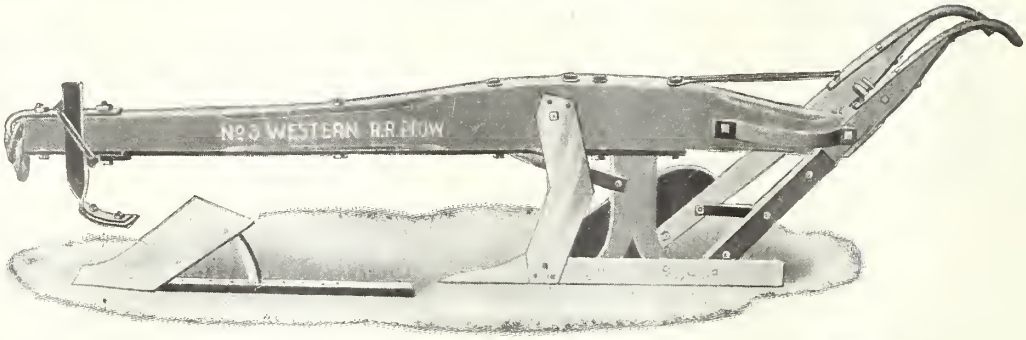

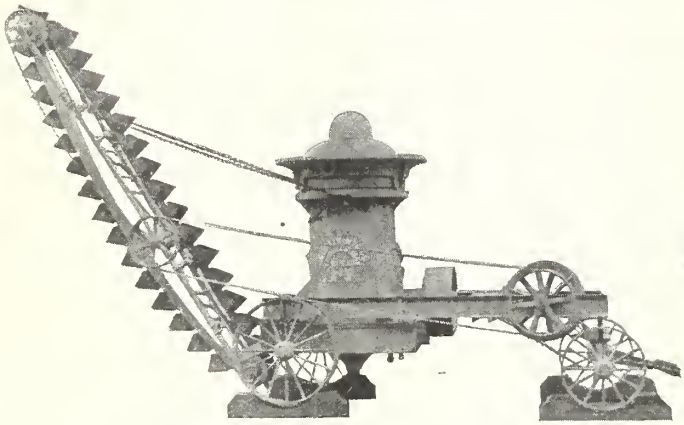

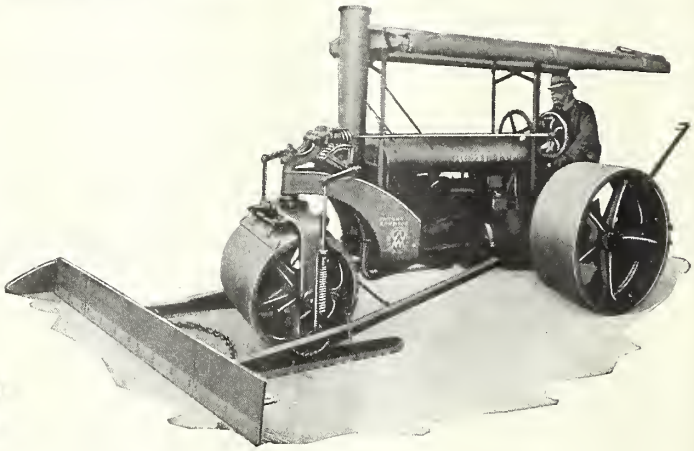

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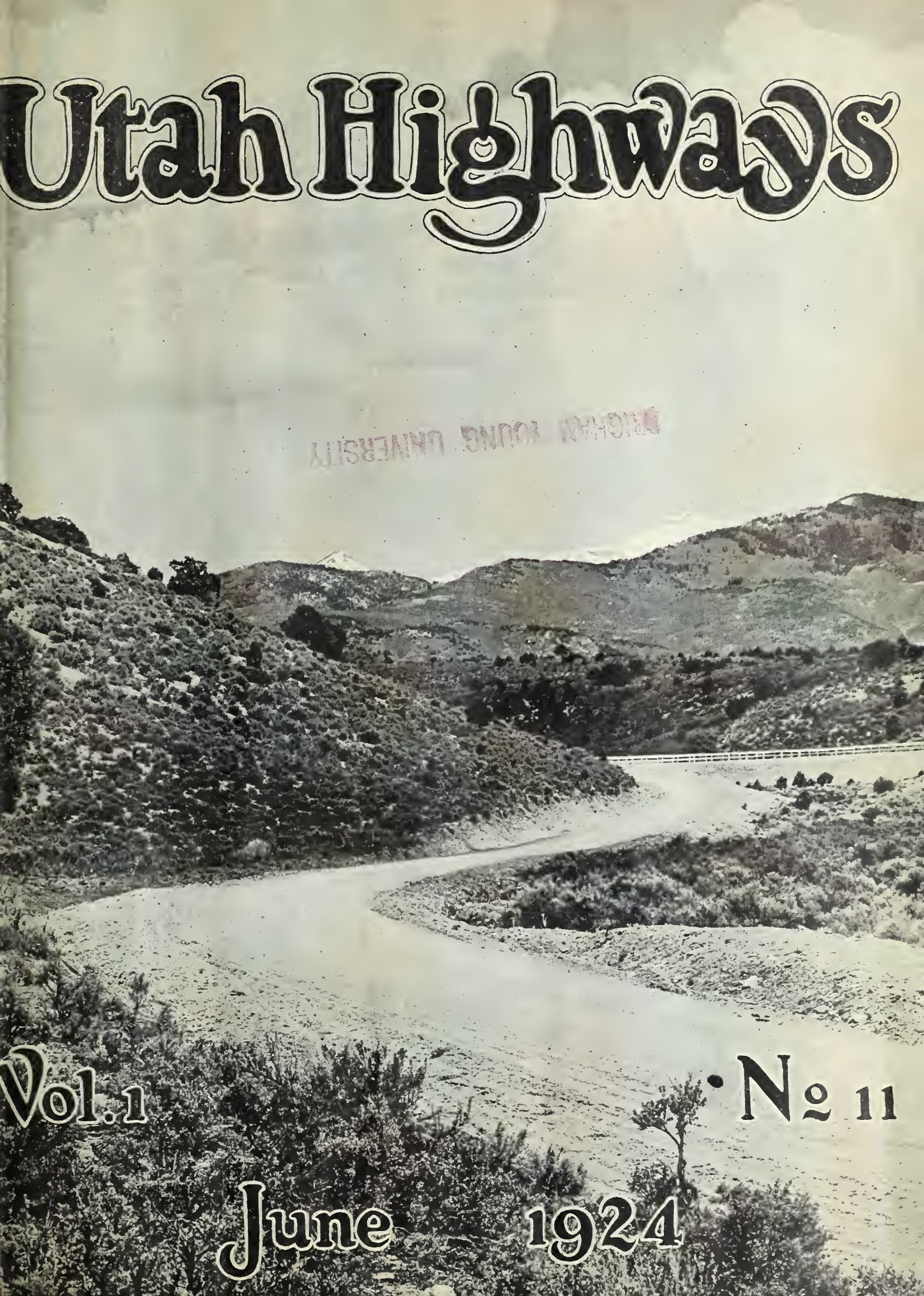
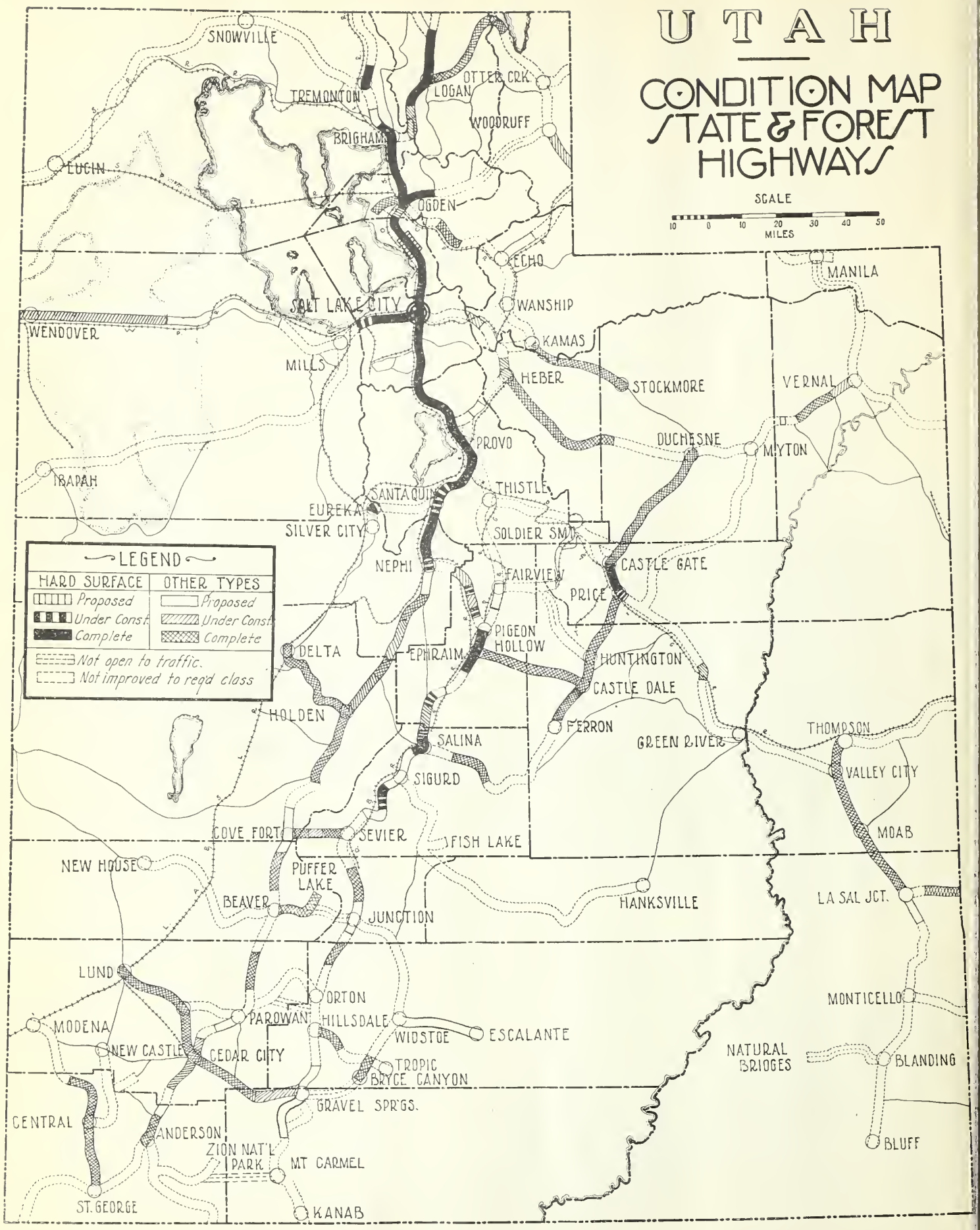


Vol. 1 · № 11

June 1924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SCALE
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MOAB
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HILLSDALE
WIDSTOE
ESCALANTE
NEW CASTLE
CEDAR CITY
TROPIC
NATURAL BRIDGES
BLANDING
BRYCE CANYON
GRAVEL SPR'GS.
CENTRAL
ANDERSON
ZION NAT'L PARK
MT CARMEL
BLUFF
ST. GEORGE
KANAB
LEGEND
HARD SURFACE
Proposed
Under Const.
Complete
OTHER TYPES
Proposed
Under Const.
Complete
Not open to traffic.
Not improved to req'd class

Utah Highways

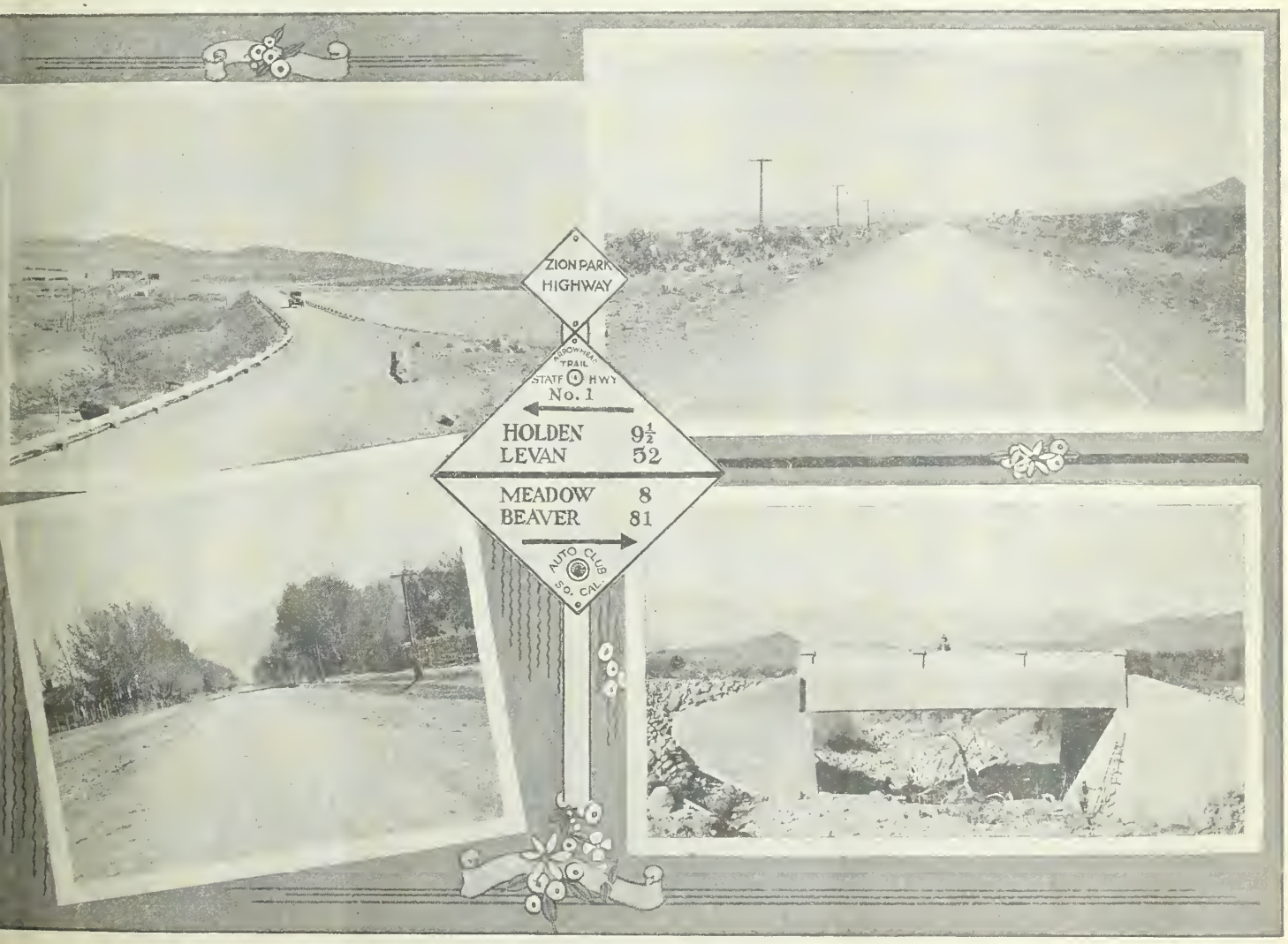
OLUME 1. JUNE, 1924 NUMBER 11

Zion Park Route Attaining High Standard

Our cover picture for this issue shows portion of the recently completed road ough Wildcat canyon in northern Bea- county on the Zion Park-Arrowhead hway. Easy grades and a pleasing gnment were secured by the locating gineers throughout this ten-mile proj- through difficult country. The gravel facing on this section is of excellent lity, Beaver county being the fortu- e possessor of some of the finest road-building material to be found in the state.

Reference to the state road condition map for this month will show at a glance the extensive improvements completed or under way on the 350 miles of this highway between Salt Lake City and the Arizona line. Beginning at Salt Lake the road is paved as far as Payson, and the paving of 8.5 miles is now in progress from Payson south to a connection with the 16 miles of pavement in Juab county. With the completion of the connecting strip the road will have 90 miles of continuous hard surface between Salt Lake and Nephi.

Sixty miles of gravel road have been recently built to federal standards and forty additional miles are now under construction. The longest continuous stretch of gravel road to be completed and accepted to date by state and federal en-



ojects recently completed on Zion Park-Arrowhead road. Above, encircling reservoir on Levan-Chicken Creek project 17-C d Buckhorn Flat project 15, showing excellence of surfacing. Below, Scipio-Millard, 17-A, looking north from Scipio, and one of four bridges on project 12 in Washington county

gineers is project No. 9 in Millard county where 23 miles under four contracts have been constructed between Holden and Kanosh. Of the 30 miles in project 17 between Scipio and Levan two sections, A and C, totaling 20 miles, are finished. Section C, 9 miles long, eliminates two railroad grade crossings and is heavily graded across several miles of marsh. The remaining section of this project is under construction as is also the 12 miles between Scipio and Holden. South of Kanosh two other gravel surfacing contracts have been recently completed, the Buckhorn flat section of project 15 in Iron county and the Anderson's-Ash Creek road in Washington county, these two projects adding 17 miles to the completed portion of the highway. In Iron county 12 miles are under construction between Cedar City and Kanarra. Of the 18 miles of road on which plans have been completed and submitted to the federal bureau for approval, 8.6 miles include the relocation of the present road through the Black Ridge dugway in Washington county, which, when constructed, will complete the improvement of 16 miles of difficult and expensive road building between Anderson's and the Iron county line. The funds with which to finance the state's cost of the Black Ridge project have been underwritten by the various counties on the Arrowhead Trail and an amount nearly sufficient has also been raised by the same means to finance the improvement of 11 miles of road between Anderson's and Zion Park. Other plans which have been submitted for approval include the construction of 12 miles between Parowan and Cedar City.

Surveys are being made in Washington county between Anderson's and St. George and in the vicinity of Cove Fort, from which point an improved forest road crosses the Pavant range to a connection with the Bryce-Grand Canyon highway at Sevier. The forest service has also constructed and is now engaged in widening and otherwise improving another connecting route from Cedar City east to Gravel Springs as a part of the scenic highway loop which is to include Cedar Breaks, Zion Park and Bryce Canyon.

Permission has been granted the Auto Club of Southern California to sign the Zion Park-Arrowhead, the Bryce-Grand Canyon highway, and connections and a number of other roads in central and southern Utah. On the Zion Park-Arrowhead the name "Zion Park Highway" is to appear on an auxiliary sign nine inches square above a larger sign denoting the Arrowhead Trail. This double designation will be carried, under the terms of the agreement, through Arizona, Nevada and California to Los Angeles. The road taking off at Anderson's leading to La Verkin and thence to Zion Park will bear the name of Zion Park-Harding Memorial highway. In this the commission seeks to perpetuate the memory of the trip made by the late president to Zion Park, which was regarded as an official announcement of the opening of Utah's scenic wonderland to the world.

Highway Notes

Weber County

Weber county's board of commissioners in the face of active opposition on the part of the Ogden chamber of commerce have awarded a contract for the paving of one and one-half miles of highway between Harrisville and Plain City with a bituminous rather than a concrete surfacing. The contract went to the Union Construction company on a bid of $45,085.

The state road in the upper valley between Huntsville and Middleton is receiving a capping of several inches of gravel, seepage during the spring having rendered this piece of road nearly impassable.

Davis County

As an aftermath of the floods of last year which completely choked the stream channel of Farmington creek, the state road commission has entered into an agreement whereby a portion of the cost of building a crib dam to control the gravel and silt that is washing d from the canyon will be paid from state road maintenance fund, the B berger Electric railroad and individu also contributing to the cost of the d Additional improvement contemplate the construction of a new creek chan The work which is to be done immedi ly will cost about $2,000. A similar c dition exists at Willard, in Box El county, where a dam to control gr deposits from Willard creek will be c structed, the state road commission the Willard Water company going " 50" on a cost estimated at $3,000.

Emery County

Heber Fransden has completed the stallation of new culverts in the s highway north of Woodside. Fall gr ing will include raising the grade c numerous low spots above flood leve

Kane County

The resignation of H. E. Bowen state road agent has been accepted

Present road through Devil's Gate, Weber Canyon, Davis county, to be improv as F. A. P. 62-A

county commissioners asked to fill position temporarily from one of ir number. Mr. Bowen explained in etter to the road commission that he s out of the county too much of the e to continue his work as agent.

Box Elder County

Construction of an Idaho connection m Tremonton via Snowville and the lusion of this route in the federal aid tem was recently urged before the te road commission by D. G. Nelson l A. L. Peterson of Snowville. The egates pointed out that the proposed struction would shorten the routes to in Falls, Idaho, and roads to the thwest by seventy miles as compared h the present route through Malad l Pocatello. The road commission has viously recommended an Idaho con- tion via Snowville but Idaho has not l a sufficient mileage allowance in federal aid system to meet a Utah d at the boundary north of Snow- e. The Cache valley route is the only approved to date by the secretary of riculture, the federal aid road in the lad valley ending, for the present, at emonton.

Utah County

The new state road between Santaquin l the Tintic mining district is being in condition to sustain the heavy ffic between Eureka and the pave- nt in Utah county. Considerable ading has already been done to give road better drainage, and later, in vicinity of Santaquin, gravel sur- ing will be applied.

Cache County

State Road Agent A. H. Powell has l a crew with tractor and graders at rk in Logan canyon. This road, aside m its important Idaho and Wyoming nnections at Bear lake, offers an im- essive scenic drive through one of ah's most beautiful canyons. The rk now being done is part of an an- al program of widening the road.

Duchesne County

Good progress is being made on the nstruction of the dugway three-quar- rs of a mile long, from the Upalco nch to Lake Fork river. The work is der the supervision of the county hich has contributed $1000 to its com- etion, the various surrounding commu- ties undertaking to meet the balance the expense. The road will shorten e distance between Roosevelt and Du- esne by 10 miles. A bridge will be nstructed over the Lake Fork river; e road leading through Arcadia and e bench by the Knight ranch to Du- esne connecting some of the richest ctions in the basin.—Roosevelt Stand- d.

San Juan County

The department of Indian affairs, the tional forest service, San Juan county d the town of Blanding have entered to an agreement to expend $2,000 on e road leading from Blanding through e LaSal national forest to the natural idges. Construction is already under y with Heber Frost, state road agent, charge of the work. The funds pro- led will be sufficient to provide a good ad to the forest boundary and will ubtless hasten the improvement of the ad lying within the confines of the rest and afford a more convenient mode of travel for tourists wishing to visit the bridges which are inaccessible at present to automobile travel.

Uintah County

For the better administering of road funds in the county and to make an equitable distribution of the same to all sections, the county has been divided into three road districts with a commissioner at the head of each district.

W. L. Fletcher has the Maeser, Dry Fork and Randlett districts. Fred Feltch has all east of this district and Roy Taylor has all west of the section.

The funds for road purposes are equally divided, and warrants are issued and charged to each district. The plan seems to be working out to the very best advantage.—Vernal Express.

Grand County

Charles Stewart, state road agent, with a force of men and teams has begun work on the Pikes Peak highway in the vicinity of Cisco. Last year part of the highway in that section was graded and the work just begun is undertaken for the purpose of connecting a stretch of four miles with this grade. Additional work will be done on the stretch of the road from Cisco to the Colorado line, where recent storms caused some damage. A patrolman is regularly employed on this road.

Road Improvements in Salt Lake County

Jesse H. Wheeler, state road agent in Salt Lake county, has had a force of men with six trucks and a steam shovel at work widening the reservoir hill in Parleys Canyon. At this point a narrow dugway on a steep grade has been widened to 24 feet and the grade considerably reduced. Nearly 10,000 cubic yards of earth and work have been moved in making the required excavation over a distance of half a mile. The improvement also includes the construction of a rubble masonry retaining wall containing about 9,000 cubic yards. Farther down the canyon an additional 600 feet of masonry wall will be built this summer for bank protection during the flood season. At Point of the Mountain on the Salt Lake-Provo road 1500 feet of guard rail will be placed along the dugway. At Magna a connection is to be made between the end of the 33rd South pavement and the canal bridge, the point of beginning of the pavement on Federal Aid Project No. 39, on which concrete pavement is now being laid to the Tooele county line.

WIND RESISTANCE

The newer cars travel more comfortably at 40 miles an hour than the older ones did at twenty, and the increased comfort has helped the driver to forget that it takes as much power to overcome inertia and wind resistance at any given speed as it ever did. Actual tests show that a car of a certain body shape and driven at 50 miles an hour requires 22.6 H. P. to overcome the wind resistance, while the same car running 30 miles an hour needs only 4.8 H. P. Another car with a different body shape requires 10 H. P. at 50 miles an hour and 2.5 H. P. at 30 miles—Compressed Air Magazine.

CLEANING THE WINDSHIELD

Rub a half-and-half mixture of kerosene and glycerine on the clouded surface of the glass. A small bottle of this mixture, tightly corked, may be wrapped in a little waste, put in a half-pound baking powder can, and stored away in the car. When it begins to rain pour a small portion of the mixture on the waste, rub it over the damp surface of the glass, and all water will spread out in a thin sheet wherever it comes in contact with the glycerine, instead of forming little globules, which are so detrimental to clear visibility.

1923 was a record year for iron and steel production, savings bank deposits, and automobile sales.

View from surveyed line of La Sal Junction-Wilson Wash, Project No. 7, in San Juan county, showing natural bridge

Highway Contracting, Its Illusions

BY T. J. WASSER

The good road movement throughout the country, advocated by the progressive type of citizens, fostered by the federal, state and county governments and financed by moneys raised by bond issue and direct taxation, has produced an industry that statisticians will tell you is second only to the agricultural of this country, which means that they talk about it in the millions and hundreds of millions of dollars.

Why should it not attract men and capital, and as there are several factors entering into the makeup of the industry, one looks for what he considers the most lucrative and naturally selects that factor having the game of chance connected with it, having in mind the possibility of large returns for the money invested, and therefore decide to become a highway contractor.

In former years and not so long ago, road building was considered only a part of general contracting carried on by antiquated methods and equipment, with no respect for time. But what have we today? Highway contracting a highly specialized business based on two fundamentals and four essentials, carried on successfully only with the use of modern type of machinery. the best grade of materials and handled without delay in the shortest possible time in order to insure a profit on the money invested.

Into this present field of highway contracting we have two types of contractors, the individual firm or corporation that were in the business when the modern hard surfaced highway was first introduced and have progressed with the movement for modern highways throughout the country, many at great loss and expense, but financially able to weather the experience and today represent our successful highway contractors. The other, the inexperienced individual, firm or corporation who broke into the business in recent years with a vision of large profits, but who in reality had a lot of false ideas in their mind. What are the results?

Through lack of knowledge or experience of the newcomer, work is generally underbid, competition destroyed, capital lost, the work delayed and the public that finance the work dissatisfied due to being deprived of the use of the road for two or there times longer than that necessary to complete it.

Compare that condition with a job awarded to an experienced contractor with sufficient capital to complete and who does complete the work satisfactorily and on time with a small average margin of profit on the money invested (and not the large profits Dame Rumor would have you believe) and you have a general satisfactory result.

How are you to protect the newcomer?

First—By showing Capital and Inexperience that large profits are an illusion.

Second—By establishing a standard, by comparison between the two types of contractors in order that the public may know.

Third—By making the standard of responsibility such that only after proven ability can a contractor enter into the competitive field of highway contracting.

Fourth—By obtaining the cooperation of those responsible for the conditions governing the design and supervision of the work.

Contracts for highway construction are awarded in sums up to a million dollars, the majority of contracts being valued at from $200,000 to $500,000. Naturally the percentage of profit that one is entitled to on such amounts is what attracts and the case in which one can qualify as a responsible bidder is the contributing primary cause of so many failures.

Before going into the details, let me compare the two types of contractors referred to, because on the result of the comparison depends whether profits can be anticipated or failure assured.

The writer has previously stated that highway contracting was based on two fundamentals and four essentials.

The fundamentals are:

First—Transportation of materials.

Second—Construction methods.

In the former the transportation includes the handling of the materials from the point of delivery of the common carrier to the site of the work at the point of operation and upon this alone may depend success or failure, all other conditions being equal.

In the latter, only the most modern arrangement of plant, operated at a uniform rate of progress will insure success.

In order to carry out these fundamentals, one must have experience, skill, organization and sufficient capital to properly equip and carry on the work. With these four essentials, backed up with integrity and responsibility, success is assured. Lacking in any of the four essentials, failure will result and profits disappear.

The newcomer into the field of highway contracting usually is any one of the following—a contractor experienced in another branch of construction, an individual or bank with money to invest, a former job superintendent who knows nothing but the field construction work, the individual with money and no knowledge of the business, or any combination of these.

How did any one of them come to attempt highway contracting?

The writer firmly believes that the publication of the vast sums of money to be spent for highway construction is the primary cause. The reprinting and distribution of the figures by manufacturers of highway equipment to prospects to increase their sales have misled many to enter the business.

The eagerness of capital to participate is shown by the case with which inexperienced contractors can obtain funds until his inexperience demonstrates that the banker is directly in the highway contracting business.

Why is it that keen executives who manage large successful bonding firms of this country do not strike out n and adopt a policy of conservative, sa bonding into which later they are goi to be forced?

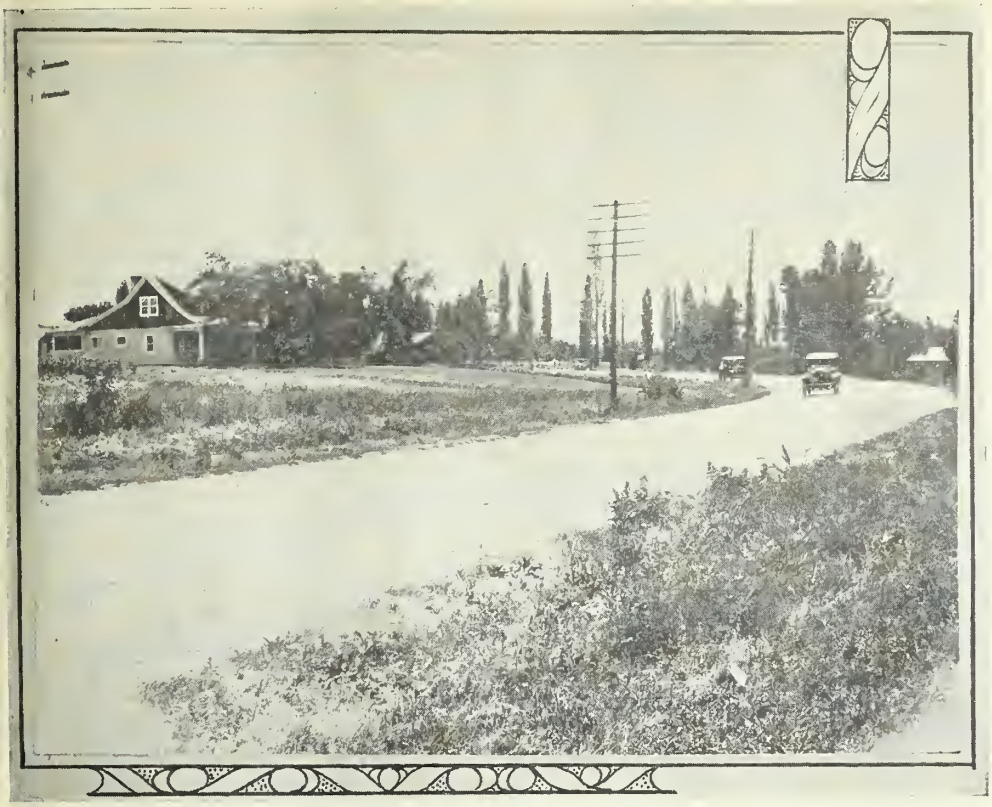
The ease with which inexperienced co tractors can be made responsible bidd by the eagerness of the bonding comp nies to go on their surety that they t against their will sometimes get into t highway contracting business.

All of these unsatisfactory conditio could be avoided if the bonding comp nies had to do business only throu permanently established agents, elir nating the broker that has no place business.

Bonding companies should adopt schedule of surety by which a lin would be placed on the amount of sure the company would assume on the fir time the applicant applies; for examp —say up to $60,000 if the work was co pleted satisfactorily and the same a plicant makes a second request for bond the limit should be placed at, let say $125,000, after which, if the contra is satisfactorily completed, the bondi company should issue a certificate pla ing the applicant on the preferred competitive list, which, providing his fi nancial statement warranted it, wou class him as a responsible bidder f highway construction.

Now let us consider the experienc contractor and not some of the unre sonable conditions in highway constru tion that he has to contend with, and is for that reason that cooperation wi those responsible for the conditions go erning the design and supervision of th work should be obtained. For exampl in estimating on work, the contractor required to assume all the elements chance. I believe insufficient time given to the preparation of plans an instructions to bidders and quite fr quently proposals are prepared wher for instance, an item for excavation required to also cover clearing, gru bing, ditching, etc. Highway contrac ing is the only branch of constructio industry that has to contend with ou side interference, and that at contractor's expense. I refer to maintaining traff through the construction and the inte ference from public utilities, especiall those with sub-surface structures. It impossible for the contractor to figu what the above conditions referred t will cost him, yet the requirements o bidding demand that he take care o them.

The requirements for accurate wor are more severe than in any other branc of the construction industry, for exampl the preparation of sub-grade and settin of forms are such that no variation allowed, yet frequently field errors o cur which the contractor has to abso and at times are very costly, also th fact that the sub-grade has been pre pared with any great care, yet it is im possible to produce a pavement of th exact thickness and crown as specifie Any variation in the thickness of pave ment is always at the contractor's ex pense, whether it is over or under th specified thickness.



State road in Davis county

Of all elements entering into the construction of a highway, the highway contractor is the only one to furnish a surety guaranteeing to do something most of which is beyond his control, for example, the specified requirements for materials in many cases are such that the contractor is limited to one or two sources of supply, the owners of which, together with the common carrier may deliver the material promptly or when convenient, but the contractor must not only pay for delays but also guarantees the completion of the work on time.

Highway contracting confined to about nine months in the year, carries a burden more costly than the actual idleness, namely, the loss of an organization, it being necessary to reduce the forces during the inactive season; due to changes annually in the organization, the abuse of the equipment under such change is very expensive and shortens the life of same, which is short enough under favorable conditions. Another feature affecting the life of the contractor's equipment is when radical changes are made from year to year in the design of the highways, thereby requiring new equipment to be purchased and the last year's equipment to be scrapped.

The contractor places the orders for material to meet the requirements specified, failure to meet the requirements, the material is rejected, but who pays for the loss and delay? The contractor.

Delay from any cause whatever, such as labor troubles, stormy weather, rejection of material, inexperienced inspection, delay in delivery of materials, results in big losses to the contractor inasmuch as all profits on the work were figured at a daily rate of progress.

Anything in the future that can be worked out between the contracting parties to reduce to a minimum the elements of chance will go a long way towards reducing the cost of highways.

In conclusion I would say that the time has arrived for all parties interested in the development of modern highways to get together by conference and settle all questions that are involved.

Jacks Protect Highways

Weighing jacks with which the load carried by a heavy truck is ascertained by road police are helping Maryland protect its new state roads from damage by overweight vehicles. Most roads are constructed to withstand a moving load of 10 tons. Heavier loads break down the subgrade and start ruts, the police assert.

Each weighing machine consists of a screw-jack operating in an oil-filled cylinder. When four of these jacks are placed under the suspected truck, lifting it clear of the ground, its weight is transferred to the oil cylinders and can be read directly on the pressure gauges. If the truck is found to weigh more than 10 tons, the excess materials is unloaded by the roadside. The jacks are of aluminum alloy, weighing only 40 lbs. each, so that the inspectors can carry them about in a light car.

State officials estimate that this supervision reduced overloading 75 per cent within 30 days. California has also recently passed a law limiting the weight of motor trucks, and road officials and taxpayers are seeking to reduce the maximum permissible weight below the limit now set—30,000 lbs. gross weight for 4-wheel trucks and 40,000 lbs. for 6-wheeled vehicles, providing the axles are at least 96 inches apart, and there are not more than 800 lbs on each inch of rubber tire width.—Popular Science Monthly.

HERE'S WHY LEFT TIRES OUTLAST THOSE ON RIGHT

The fact that automobile tires on the right side of the car wear out more quickly than those on the left side is one which many motorists are unable to explain.

A popular misconception is that turning corners more frequently to the right than to the left is responsible for this wear. Such, however, is not the case.

The reason that tires on the right side wear more quickly is that they carry a greater load than their brothers on the left. The natural slope of the street or road causes more of the load to rest upon the right side of the car.

In addition, the natural tendency of the car to slide sideways because of the road slope must be counteracted more by the tires on the right than by those on the left.—The Golden Circle, North Shore Motor Club, Chicago.

More than 4,500,000 autos and trucks are owned on farms.

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Utah Highways

Published Monthly
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H. V. RICHARDS, Editor

COMPLETING OUR FEDERAL AID HIGHWAYS

Of the 3,222 miles of state roads in Utah 1,588 comprise the federal aid system. On this mileage federal funds up to 74% of the total cost may be expended for construction, providing the total does not exceed $30,000 per mile. Under the law we are allowed 1,684 miles, or 7% of the 24,050 miles of road in the state, the 96 miles remaining to be designated as a part of the system being reserved pending the approval of a route into the Uintah Basin to a connection with the federal aid highway from the Colorado line to Duchesne, and from Tremonton to the Idaho line. The road from Castle Gate to Duchesne was constructed with federal aid on the former basis of equal percentage of state and federal funds as a post road, but the road is not now on the seven per cent system. Altogether 166 miles of state roads that are included in the federal system have been improved with federal aid, the principal routes in addition to the one mentioned being from Price through Castle Dale to Ferron, Delta to Holden and Lund to Cedar City. On the federal aid system the bureau's records show 215 miles of highway completed and accepted, projects now open to traffic but on which the contractor has not been released, bring this total to 274 miles, 180 additional miles are now under construction. There is a large mileage on the system that has been improved without federal aid. The state has built nearly 200 miles of gravel surface roads and 146 miles of pavement on roads that are now on the federal system with state and county funds. Assuming that none of the gravel mileage conforms to present federal standards either as to width, grade or quality of surfacing, we have with federal aid projects constructed, and the pavement built by the state, 420 miles of highly improved roads on the federal aid system, slightly more than one-fourth of the total mileage.

The present rate of construction is 100 miles per year with an annual expenditure of $1,500,000 or an average cost per mile of $15,000 including all bridges built. This is exclusive of other departmental expenditures for maintenance, preliminary engineering and administration which bring the total annual outlay to $2,000,000. The maintenance costs are distributed over the entire state road system while construction is confined, under our present financial circumstances, entirely to the federal aid system.

Adding 100 miles annually to our improved highways means that it will take at least ten years to complete the federal system, assuming that our federal allotment remains at $850,000 per year and that there is no great increase in assessed valuation. The program of construction of first-class gravel roads on which the state is now well embarked will tend to increase the annual mileage built but there are two factors which will tend to slow it down. One of these is the paving of a considerable mileage of gravel roads which will be necessitated during the ten year period, and the other the resurfacing of much of our present pavement, as it fails or becomes inadequate due to the increase in weight and density of traffic.

There does not appear to be any likelihood of the state undertaking any other than a "pay-as-you-go" policy in the completion of the highway program; our bonded indebtedness is $9,910,000, on which there will be, commencing with 1925, an annual interest and sinking fund charge of $1,038,900. Of the total bonded debt $7.260,000 are state road bonds and our annual bill for road construction of former years is $773,900. The average per cent of bonded debt to assessed valuation throughout the country is .68 per cent, that of Utah at the present time is 1.4 per cent.

It is not considered that any emergency exists or will arise which will compel the state to increase its bonded debt in order to expedite the highway program. While mindful of the fact that present traffic requirements demand safe and smooth riding highways the commission expects to adhere to its conservative program of construction. The users of the road will be served rather in the degree of attention which will be paid to the maintenance of all types of roads from the newest pavement to graded earth. There is no way for the state and counties to offer the public really good roads other than by constant attention to the details of maintenance, and to this end it is necessary to have a trained, efficient and dependable maintenance organization. The funds derived from the gasoline sales tax have enabled this state, with county cooperation, to undertake this year a program of systematic maintenance which it expects to develop and extend as the means become available. In this way we hope to add years to the life of both our gravel roads and pavements, lengthen the period of service of the road dollar, give our citizens a full measure of service and pleasure in the use of the roads and cause the stranger to remember Utah highways with grateful appreciation.

IN THE FUTURE

Just what the future holds for transportation no one can accurately foretell. That it will be marvelous and almost past present day comprehension is certain. The man who today speaks of launching a great torpedo, spacious enough for both passengers and freight, to the planet of Mars, may not be considered mentally abnormal one hundred years from now. Although such a feat seems impossible, many people today put credence in proposed plans even more visionary, and that with some cause; for, when we consider the marvels, wireless telegraphy, radio, electrical apparatus of all kinds, and other inventions equally great, we realize that "anything is possible."

It was only a little over half a century ago that our grandfathers were slowly winding their way across the continent in covered wagons. Slowly and painfully, week after week the weary journey was continued until death from starvation, lack of water, or wounds inflicted by marauding Indians, brought them to a different journey's end. At the present time, people make that same trip simply for pleasure; and what a difference in conditions. The process of evolution has given us good roads, automobiles, security and pleasure in place of Indian trails, prairie schooners, dangers and hardships.

Who of the old "Forty-niners" would have believed that the not distant future would be a time when ships that travelled through the air would make the coast-to-coast journey in almost the time it took them to prepare and eat breakfast, harness up and get under way for the day. Truly the comparison tends to prepare us for great strides in the matter of transportation which may be made in the future.

Possibly a bit exaggerated and perhaps a few years premature, yet on the whole a true prophecy, is the following story taken from the Pittsburgh Chronicle-Telegraph:

It was in the year 1935. A New York matron, coming down to breakfast, met her only son ascending the stairs. He was headed for the roof, where his fast airplane awaited him.

"Where to, Tommy?" asked the matron.

"Denver for lunch, mother."

"Well, you have a perfect day for flying."

"That is what I thought. So from Denver I may hop off to San Francisco for a little golf."

"Very well, my son. But be home early for dinner."—Texas Highway Bulletin.

FEDERAL ROAD FUNDS DISTRIBUTED

Secretary of Agriculture Wallace has announced the apportionment among the states and Hawaii of $75,000,000 for federal aid highway construction for the fiscal year beginning July 1, 1925. These funds may not be used for construction prior to that date but plans and estimates for projects involving these funds may now be submitted for approval. Utah receives, under the apportionment, $847,741, which is less than any of the contiguous states. The federal aid mileage in the 7 per cent system, the apportionment for 1925 and the total federal aid allotted from the passage of the federal aid highway act in 1916 up to and including 1925 for Utah and surrounding states being as follows:

	Total Federal Aid Mileage	Apportionment for 1925	Total to 1925
Nevada	1422	$ 947,623	$6,216,354
Idaho	2783	936,698	6,677,712
Wyoming	3099	936,372	6,687,350
Colorado	3300	1,361,482	9,559,881
Arizona	1498	1,053,000	7,495,700
Utah	1588	847,741	6,116,472

In making the distribution the law reads that following a deduction not to exceed 2½% for the purpose of administering the act the apportionment shall be made among the several states in the following manner:

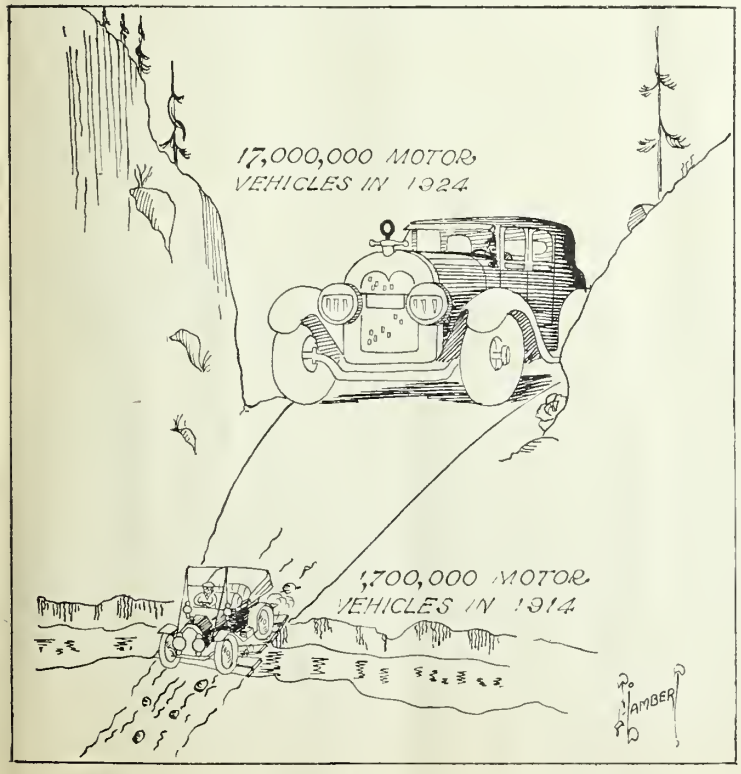
One-third in the ratio which the area of each state bears to the total area of all the states; one-third in the ratio which the population of each state bears to the total population of all the states in accordance with the last federal census; one third in the ratio of mileage of rural delivery routes and star routes of each state to all the states as shown by the certificate of the postmaster general.

The federal funds included in the 1924 apportionment amounting to $735,784 for Utah are all absorbed in projects that are in various precontract stages and on which construction may begin on July 1 of this year. No program has as yet been outlined contemplating the absorption of the 1925 funds.

ROAD BUILDING NOT KEEPING PACE WITH TRANSPORTATION FACILITIES

"Engineering Contracting" of Chicago, calls attention to some very striking facts regarding the increase in motor vehicles as compared with the increase in general road mileage but more especially improved road mileage.

Another fact that is clearly shown in these discussions is that the cost of labor and materials, hence the cost of public works generally, were twice as much in 1923 as in 1912 but since 1913 was the last year before the war, prices have been equated for the purpose of comparison with the 1913 basis.



More and better roads wanted for 1924 model traffic

In 1913 there was expended on the rural highways of the nation $176,524,000. In 1923 there was expended on rural highways $943,189,000, but had the prices of labor and materials remained the same as in 1913, the same amount of work could have been accomplished for $510,000,000 instead of upwards of $1,000,000,000, or approximately 54 per cent of what the work actually cost at present prices.

Another and more striking feature is this: In 1904, there were only 58,000 registered automobiles in the United States and 37,000 miles of roads of all classes per each 1,000 automobiles and only 2,650 miles of improved roads for each 1,000 automobiles. In 1923 the total number of motor cars (estimated) was 13,500,000, and the total mileage of roads of all classes, improved and unimproved, per thousand cars had dropped from 37,100 to 212, while the mileage of improved roads per thousand motor cars had dropped from 2,650 to only 29, or putting it in a different way, the improved road mileage had increased only 2½ times, whereas the number of motor vehicles had increased over 200 times. In 1914 there were 1,700,000 motor vehicles of all classes, in 1924 the number is estimated to exceed 17,000,000.

The above figures clearly show that while many people complain of the amount of money going into public works, more especially into the public highways of the country, it is a striking fact and not much to our credit that there were 100 times as many miles of improved roads per 1,000 motor vehicles in 1904 as there were in 1923.—Michigan Roads and Pavements.

MAINTENANCE OF PAVED STATE ROADS

The maintenance budget for 1924 carries $200 per mile for upkeep of our paved roads. Much work is being done this year on our hard surface mileage in the cleaning up of the right of way, improving drainage conditions which includes clearing culverts and digging additional drainage ditches. The total cost of the work will be kept well within the estimated limit, Levi Muir, materials engineer, who has also general supervision of the forces engaged in the maintenance of paved highways, stating that the cost of surfacing repairs is less than in former years. Improvement in organization and methods are resulting in less material used in patching and a lower cost of the material going into the repair of the 200 miles of hard surfacing maintained by state forces has materially reduced the cost of this work. Asphalt, at eleven cents per gallon, is used in sealing cracks and joints and filling surface irregularities, in place of the coal tar product which the state has previously purchased for this work and which cost about eighteen cents a gallon. A finer grading of the sand used in the work and improved forming devices have not only greatly expedited the work of making repairs but also caused a marked decrease in the quantity of material required. The maintenance crews are instructed to allow the asphalt in no case to exude above the pavement surface, not only in the interest of economy but also of the riding qualities of the surfacing. The instructions to foremen, in charge of maintenance, state that any repairs which cause irregularities in the pavement are worthless and should not be attempted. Additions to repair equipment this year aside from small tools and special buckets for pouring, include one asphalt heater purchased and three built from material in the state road shops and placed in service.

Costs records now available show that the greatest expense for surfacing repairs has occurred in Cache county on the Logan-Wellsville road where the average is $80.00 a mile. The lowest is in Juab county where but two barrels of asphalt were used in repairing fifteen miles of concrete pavement constructed in 1922. In Davis county, which has some of the oldest concrete roads in the state, paving repairs were effected at a cost of $35.00 per mile. This includes some repairs which were found necessary on the four miles between Layton and Clearfield on which a contract is to be let for resurfacing and widening. Approximately the same figure holds for Utah and San Pete counties.

"My radiator was leaking, your honor, and I was hurrying to a service station to have it repaired. I wanted to get there before all the water leaked out. That's why I was running at 40 miles an hour."

"If your car was that bad off, you should have had it towed in."

"It would cost me $10, your honor."

"This will cost you $20.

SPARKS from the Road Drag

Wifey (studying Spanish history): It says here, George, that those Spanish Hidalgoes used to think nothing of going 2,000 miles on a galleon.

Husband: Pooh! I never believe half I hear about these foreign cars.

Absolutely

At a lecture, the speaker orated fervently: "He drove straight to his goal. He looked neither to the right nor to the left, but pressed forward, moved by a definite purpose. Neither friend nor foe could delay him, nor turn him from his course. All who crossed his path did so at their own peril. What would you call such a man?"

"A truck driver!" shouted a voice from the audience.—Forbes Magazine.

Netty: "Would you marry for money?"

Letty: "Well, I hope Cupid aims at me with a Pierce-Arrow."—Judge.

Teacher: "This is the third time you've looked at George's paper."

Pupil: "Yes ma'am, he doesn't write very plain."—London Answers.

Decadence

Boy: "Don't sit there, sir—that seat's broke."

Testy Old Gentleman: "Humph! In my days boys had a sense of humor."—Coulmbia Jester.

They met on the bridge at midnight,
They'll never meet again;
For she was an eastbound heifer
And he a westbound train.

Soothing

"Judge," said the prisoner, "I'm deaf."

"Don't worry," smiled the magistrate. "you'll get your hearing in the morning."

"Midnight"

The janitor's little boy, very black, was nicknamed "Midnight" by his white neighbors. He didn't mind their calling him that but one day when one of his own race exclaimed "Hello, Midnight!" he indignantly retorted, "Shut up, you'se just about quarter to twelve yo'se'f!"—The Investigator.

A small boy came hurriedly down the street and halted breathlessly in front of a stranger who was walking in the same direction.

"Have you lost half a dollar?" he asked.

"Yes, yes, I believe I have!" said the stranger, feeling in his pockets. "Have you found one?"

"Oh, no," said the boy, "I just wanted to find out how many have been lost today, yours makes fifty-five."

That indefinable thing we call charm is what enables a girl to violate the traffic rules day after day with absolute impunity.

Sure Proof

Magistrate—"And what was the prisoner doing?"

Constable—"'E were 'avin' a very 'eated argument with a cabdriver, yer worship."

Magistrate—"But that doesn't prove he was drunk."

Constable—"Ah! But there weren't no cabdriver there, yer worship."

The Reason

What makes us hate the guys who speed,
And cuss' em and sass 'em?
It's this, I think: We loathe the breed
Because we cannot pass 'em.
—Detroit Motor News.

Webster Abridged

Son (reading)—"Pop, what is a pedestrian?"

Pop—"A pedestrian, my son, is the raw material for an automobile accident."—Judge.

Yes! We have no . . . .

Lady Prospect—"Are you sure you have shown me all the principal parts of this car?"

Eager Agent—"Yes, Madam, all the main ones."

"Well, then, where is the depreciation? My husband told me that was one of the biggest things about a car."

I Don't

Most motorists are blooming fools,
They trifle with the traffic rules.
I don't.
No man should try to get the drop
On any seasoned traffic cop,
Nor fail to heed his sign to stop.
I don't.
A man should never drive too fast,
Or brag about the cars he's passed.
I don't.
For safety first should be his creed.
There really isn't any need
To drive a car at reckless speed,
I don't.
A man should never lose his bean
When piloting a gas machine.
I don't.
On city street or open road
A man should never break the code,
Nor fellow-farers incommode.
I don't.
He should not scare equestrians,
Nor chase the poor pedestrians.
I don't.
In fact, I have no car to run,
I'm shy the coin to purchase one;
You'd think I wouldn't have much fun.
I don't. —Exchange.

Send This Poem to Friend Wife

When the evenin' shades is fallin'
At the closing of the day,
An' I'm jest settin' round
A passin' of the time away,
There's a thought that comes to cheer me
If I'm feelin' kind of blue—
Sort o' little prayer o' gratitude,
Fer crossin' paths with you.
So I'm sendin' you this letter
Jest because I want to say
That I'm glad the Fates arranged it
So that you should pass this way;
Jest to hear your voice an' you
Made my sky a shade more blue;
An' I'm jest a bit more happy
Since a-crossin' paths with you.

"Who brought you here?"

"A policeman."

"Drunk?"

"I think he was, sir."

Stalled

Bus Conductor—"One seat on top, ma'am, and one inside."

Lady—"You surely wouldn't separate a mother from her daughter."

Conductor (ringing bell) — "Never again, lady. I did it once and I have regretted it ever since!" — Humorist (London).

Son—"What is a 'she-devil' Dad?"

Dad—"If you say another word against your mother I'll whip you."

A New Alibi

Irate Wife—"John, you've kept dinner waiting."

Meek Husband—"Yes, dear, but I had to walk to where my car was parked tonight, there wasn't a taxi in sight.—The Hoosier Motorist.

The Polite World

Mother: "You shouldn't behave that way with a young man!"

Daughter—"But mother, it's done in the very best advertisements."—Life.

Too Forward

Traffic Cop—"Say, you. Didn't you see me wave at you."

Mirandy—"Yes, you fresh thing, and if Andrew were here he'd paste you one for it."—Sun Dodger.

Poor Henry

"Henry Ford's got Muscle Shoals," shouted a newsboy as he wriggled his way through the aisle of a crowded Canal Belt car Monday afternoon.

"What's Muscle Shoals?" asked one girl of another.

"I ain't sure," replied the other, "but I believe it's something like rheumatism. It's no wonder—that fellow Ford works too hard."—New Orleans Item.

Diplomacy

At the grave of the departed, an old darky pastor stood, hat in hand. Looking into the abyss he delivered himself of the funeral oration:

"Samuel Johnson," he said sorrowfully, "you is gone. An' we hope you is gone where we 'spects you ain't."—Exchange.

Not Loud Enough

"Jack's got a new siren for his car."

Really! What became of the blond one."—London Mail.

Highway Development As It Effects the Farmer

BY BEN H. PETTY

The historian Macaulay once said, "Of all inventions, the alphabet and printing press excepted, those inventions which abridge distance have done most for the civilization of the species." Would it be stretching the meaning of the word "invention" too far to include within its scope the development of the higher types of road surfacing? I think not, for surely the originality of developments in highway surfaces resulting from intensive experimentation and study have been as striking as in many other lines of invention.

No one is more cognizant of this "distance abridging" characteristic of the high type highways than the farmer. Those remote communities not served by rail or water transportation have been brought in touch with the centers of trade, industry, education, etc., by the extension of our road systems. Remoteness is no longer a matter of miles but of roads. The farmer living five miles from town on an unimproved road is farther removed, many times, than the farmer living ten or fifteen miles out of town on a hard surfaced highway. The former is isolated for several weeks in the year due to the road being impassable, while the latter has a smooth, hard road available for use 365 days in the year.

The successful marketing of farm produce is greatly affected by road conditions. It frequently happens that the peak market prices come at a time when the unimproved roads are practically impassable due to weather conditions. The farmers along such roads are forced to stand by impotently and watch the price levels drop for their produce, being forced to sell on a low market at some future time when it is possible to get a load into town. As a concrete example, consider the cotton market. There comes a rise of $5.00 per bale of cotton (500 pounds). The farmer on an unimproved road can probably haul only one bale to market with a single team and wagon, while his more fortunate neighbor on a hard surfaced road may haul five or six with a similar outfit. One is benefited $5.00 by the high market, while the other benefits to the extent of $25.00 or $30.00. Our secretary of commerce, Herbert Hoover, is credited with the statement that 50% of our perishable foodstuffs never reach the consumers because the farms are too remote from the markets.

The development and extension of our hard surface roads not only enables the local farmers to haul greater loads to market with the ordinary horse and wagon outfit, but of far greater importance is the fact that it makes possible the every day use of the motor truck with its attendant possibilities. The farmer has been quick to realize the great benefits to be derived from the use of the motor truck in preference to the horse and wagon. This led to a demand from the rural communities for the further extension of first class roads in order to derive the greatest possible benefits from the use of trucks.

There are approximately 300,000 motor trucks in use on farms in the United States at the present time. This averages very near one truck to every sixteen farms. This is a remarkable development of truck usage in the rural districts when it is remembered that fifteen years ago a truck was a curiosity even in the cities. The progressive farmer now realizes that the varied services rendered by a truck are of such value that he cannot afford to be without one.

In 1920 the U. S. department of agriculture sent out questionnaires to a large number of grain and livestock farmers in the corn belt who used trucks in their farming operations. A study of the 831 replies received shows some interesting results as published in Bulletin No. 931. Only 14 percent of these farms are less than five miles from market and 20 percent are fifteen miles or more. The average distance is eight miles, while the average distance from market of all farms in the corn belt is probably not over four miles. Ninety-one percent stated that they believed their trucks

Scene near Mill Creek from Highland Drive, Salt Lake county

would prove valuable investments. Six hundred thirty-five stated that the principal advantage of a motor truck was "time saved." As compared with horses and wagons, the trucks save about two-thirds in hauling time. This is significant in view of the fact that farm labor was plentiful a few years ago at fifteen to thirty dollars per month now is scarce at two and three times that amount. Two hundred ninety-nine gave "poor roads" as the principal disadvantage of the motor truck. It goes without saying that those men are enthusiastic boosters for real road improvement.

Some extensive experiments carried on recently at Iowa State college under the direction of Professor T. R. Agg have demonstrated conclusively that a gallon of gasoline will carry a ton fourteen miles on the ordinary "dirt" road, twenty-one miles on the average gravel road and 31 miles on a concrete road. In other words, it requires more than twice as much gasoline to operate a truck over an unimproved road as it does over a paved road. The U. S. department of agriculture estimates that 134,400,000 tons of farm produce go over our highways yearly. To the rural truck owner the improvement of the highways over which he operates obviously means a considerable saving not only in gasoline, but also in garage fees. The wear and tear on the truck operating over the unimproved road will certainly be much greater than on the hard surfaced type. A careful analysis of road taxes vs. garage fees will, many times, influence the farmer in favor of road improvement.

The influence of paved highways is reflected in better farming conditions. Those farmers fortunate enough to be near a newly paved road can turn from the staple farm products and develop those types of farming which bring better and quicker returns. On the unimproved roads truck gardening is usually limited to a radius of two or three miles from the city market. But with the coming of paved roads and the use of trucks this radius is extended to ten, fifteen and in some cases twenty miles from the market. Naturally the value of the land in this radius is considerably increased.

The extension of hard surfaced roads has benefited thousands of farmers through the comparatively new development of the "roadside market." By this means the farmer is enabled to dispose of considerable quantities of fruits, vegetables, etc., at his own doorstep, thereby saving the time and expense involved in hauling such produce to market. Frequently this roadside market is handled by the younger members of the family leaving the men free to engage in other profitable work about the farm. Paved roads have made possible the development of rural express routes in many parts of the United States where motor trucks make regular scheduled trips, picking up the otherwise profitless small quantity produce which the farmer places on his roadside platform. On the return trip from market the truck will deliver provisions, equipment, etc., needed on the farm.

The raising of livestock has been greatly stimulated through the development of good roads. Proof of this statement is found in the great increase in the number of hogs which now go to market via the motor truck. The old custom was to drive the stock to market with the resulting loss due to overheating and shrinkage which caused a drop in the market price. But now through the medium of good roads and the motor truck the farmer is enabled to haul his cattle, hogs and sheep to the railroad siding or, better yet, directly to the stockyards at a great saving of time and money. The combination of good roads and the motor truck enables the farmer to get his stock to the yards when the market is highest. It also permits him to dispose of his stock when it is in the best marketable condition. In many cases it eliminates the local buyer and his commission.

The Indianapolis stock yards probably lead all others in quantity of live stock received by truck. Paved roads radiate out of the city for several miles in all directions. The network of gravel roads kept in such splendid condition by the maintenance department of the state highway commission permits the operation of motor trucks practically every day with the exception of a few days in March and April when the frost is leaving the ground.

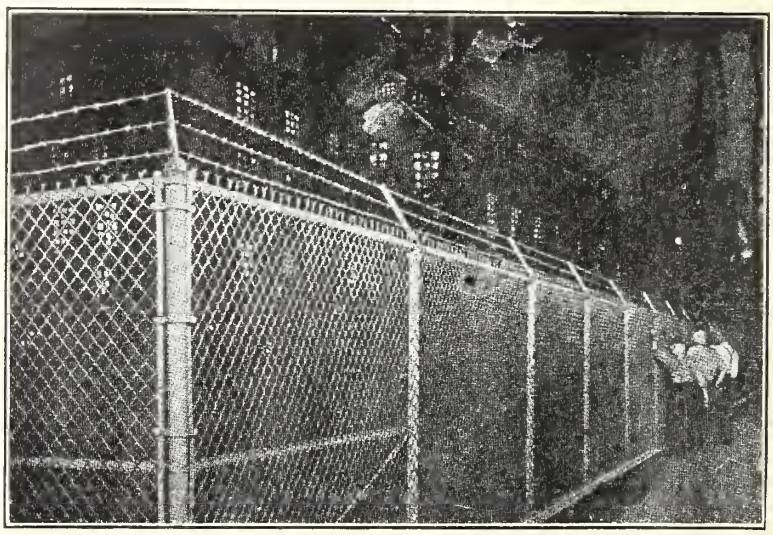
Back in 1920, 26% of all live stock received at the Indianapolis yards came in motor trucks. Over twenty unloading platforms are available for quick discharge of stock. Over 7,000 hogs have been delivered in one day at these yards.

One of the great blessings to rural communities, made possible by good roads, is the consolidated school. In 1918

(Continued on Page 12)

And now---

the last word in durable fencing



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And now—a woven wire fence with two long lives. Doubled in wear, doubled in length of service, doubly durable.

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Status of Federal Aid Projects

By F. S. THOMPSON, Chief Draftsman

UNDER CONSTRUCTION MAY 31, 1924

No.	County	Name	Type	Lgth.	Per Ct. Comp.	Contractor	Estimated Cost
4-F	Emery	Castle Dale-Ferron	Gravel	11.5	100	J. T. Raleigh Co.	$114,765.24
4-H	Emery	Rochester-Flat Bridge	Steel	75 ft.	57	J. T. Raleigh Co.	10,531.53
6-ABC	Grand-San Juan	Moab-LaSal Junction	Earth	23.25	98	Hyde & Black	372.423.13
10-B	Uintah	Ft. Duchesne-Vernal	Gravel	3.19	48	A. G. Young & Co.	
10-C	Uintah	Ft. Duchesne-Vernal	Gravel	(1.31)	65	A. G. Young & Co.	69,596.17
10-B	Uintah	Bridges for above	Wooden	4 Br.	72	Caldwell, Batty & Eaton	
17-A	Millard	Scipio-Juab	Gravel	7.08	100	Hawley, Anderson & Hinkley	48,288.16
17-B	Juab	Chicken Creek, Millard Co.	Gravel	13.87	24	Hawley, Anderson & Hinkley	93,686.67
24-C	Carbon	Price City	Concrete	1.12	7	Utah Concrete & Stucco Co.	76,839.69
31-A	Weber	Riverdale Overhead	Gravel	0.5	60	Union Construction Co.	43,072.63
31-B	Weber	Bridge for above	Steel	144 ft.	75	J. J. Burke Co.	43,974.86
33	Cache	Sardine Canyon	Gravel	6.96	77	Olaf Nelson	114,448.37
39	Salt Lake	Magna-Tooele Co. line	Concrete	6.41	87	Moran Paving Co.	210,674.70
42-A	Wasatch	Heber-Hailstone	Gravel	7.46	56	Gilkerson Const. Co.	68,904.85
42-B	Wasatch	Hailstone bridge	Steel	63 ft.	99	Christensen, Jacob & Gardner	21,682.61
43	Sevier	Richfield South	Concrete	1.5	23	Gray & Murdock	62,569.52
46	Rich	Woodruff-Wyoming	Gravel	7.4	90	Kroft & Bundy	51,537.00
47-A	Sanpete	Moroni City	Concrete	1.0	97	Reynolds Ely Co.	39,237.73
47-B	Sanpete	Moroni-Fountain Green	Gravel	7.09	96	Reynolds Ely Co.	53,298.19
47-C	Sanpete	Fountain Green	Concrete	1.0	60	Reynolds Ely Co.	32,774.95
47-D	Sanpete	Fountain Green-Juab Co.	Gravel	5.33	95	Reynolds Ely Co.	45,064.48
49	Summit	Gogorza-Salt Lake Co.	Gravel	3.06	41	Moss, Snarr & Thayne	40,448.27
50	Utah	Payson-Juab Co.	Concrete	8.56	26	Wasatch Grading Co.	261,464.68
51-A	Tooele	Knolls-Wendover (Salt Sec.)	Earth	6.06	55	N. E. Lamus	66,120.00
51-A	Tooele	Knolls-Wendover	Gravel	39.55	21	Kroft, Bundy, Zimmer & Lamus	280,000.00
52	Sevier	Salina-Redmond	Concrete	3.0	55	Gray & Murdock	96,288.13
53	Juab	Nephi City	Concrete	1.77	85	Wasatch Grading Co.	36,070.43
54	Iron	Cedar-Kanarra	Gravel	12.01	25	J. T. Raleigh Co.	110,427.19
56	Sevier	Redmond-Sanpete Co.	Gravel	2.13	0	Reynolds-Ely Co.	14,267.91
57	Sanpete	Gunnison City	Concrete	1.11	0	Reynolds-Ely Co.	42,068.70
57	Sanpete	Gunnison-Sevier Co.	Gravel	10.31	0	Reynolds-Ely Co.	93,141.82
58	Box Elder	Cache-Mantua	Gravel	4.14	33	Wheelwright Construction Co.	84,078.83
67	Millard	Scipio-Holden	Gravel	12.04	0	Hawley, Anderson & Hinckley	85,823.99

Projects for which Plans have been Submitted

No.	County	Name	Type	Length
5D	Grand	Court House-Seven Mile Wash	Bridges 1-200	1-100 ft
19B	Piute	Junction-Red Bridge	Gravel	4.5 Mi.
55A	Washington	Iron Co. Line-Ash Creek	Gravel	8.0 Mi.
60A	Summit	Echo-Emery	Gravel	11.0 Mi.
63A	Box Elder	Chase-Bear River City	Gravel	6.0 Mi.
65A	Utah	Orem-Wasatch Co. Line	Gravel	18.0 Mi.
66A	Iron	Parowan-Winn Hollow	Gravel	9.6 Mi.
72A	Sanpete	Fairview-Mt. Pleasant	Gravel	5.0 Mi.
		Plans in Course of Preparation		
7A	San Juan	La Sal Junction-Wilson Wash	Gravel	7.0 Mi.
61A	Sevier	Salina-Aurora	Gravel	1.0 Mi.
61C	Sevier	Sigurd Richfield	Gravel	1.0 Mi.
63B	Box Elder	Bear River Bridge	Reinf. Concrete	250 Ft.
63C	Box Elder	Malad River Bridge	Reinf. Concrete	100 Ft.
71	Uintah	Uintah River Bridge	Steel	100 Ft.
77A-C	Washington	Anderson Ranch LaVerkin	Gravel	11. Mi.
		Surveys Completed		
19D	Piute	Red Bridge-Garfield County	Gravel	3.5 Mi.
51B	Tooele	Timpie-Knolls	Gravel	35.0 Mi.
61B	Sevier	Aurora-Sigurd	Gravel	7.5 Mi.
64A	Piute	Marysvale-Sevier	Gravel	4.9 Mi.
73A	Utah	Springville-Soldier Summit	Gravel	30.0 Mi.
81A	Sevier	Richfield-South	Gravel	1.57 Mi.
		Proposed New Work		
68A	Millard	Dog Valley-Cove Fort	Gravel	6.0 Mi.
68B	Millard	Dog Valley-Kanosh	Gravel	6.0 Mi.
69	Iron	Parowan-Buckhorn	Gravel	14.0 Mi.
94A	Duchesne	Myton-Antelope	Gravel	10.0 Mi.
98A	Beaver	Wildcat-Millard	Gravel	6.0 Mi.
98B	Millard	Cove Fort-Beaver Co. Line	Gravel	3.0 Mi.

Surveys in Beaver and Millard Counties

Within the last month location survey parties under the direction of H. F. Hanford, locating engineer, left for Cove Fort, which will be their headquarters for the next two months while making the several road locations in that vicinity.

Progress Notes on Various Projects

The new road between the town of Woodruff and the Wyoming state line in Rich county, known as Federal Aid Project No. 46, is now estimated as being 95 per cent complete and it is expected that it will be ready for final inspection and acceptance by the end of the month. The job is under contract to Kroft and Bundy of Ogden, Utah, and is under the direction of S. C. Risley, resident engineer, for the state.

The Cedar-Kanarra road, F. A. P. No. 54, is now estimated as being 30 per cent complete. The rough grading 60 per cent and the surfacing 25 per cent. Considering the fact that the contractor has only been on the job 55 working days this progress is exceptional and both the contractor and engineer are to be commended. The work is being done by the J. T. Raleigh company of Salt Lake. B. S. Remington is engineer for the state.

Assuming that the present rapid progress continues the Sardine Canyon road extending from Mantua to Wellsville will be completed by September 1. It is rumored that a friendly rivalry exists between the two contractors on the re-

spective sections as to who will be the first to complete his section. Progress reports show that the Cache County-Mantua section is now approximately 35 per cent complete while the longer section is approximately 80 per cent complete. The Wheelwright Construction company have the contract for the first section while Nelson and Tempest have the Cache County-Wellsville part. K. C. Wright is resident engineer on both projects for the state.

The engineer reports that the Salina-Redmond pavement, F. A. P. No. 52, will be completed this month. This work is being done by Gray and Murdock who completed the adjoining Salina City work last year. They expect to move their paving outfit to the Richfield-Elsinore job as soon as this work is completed. R. A. Gillis is the resident engineer for the state on these jobs.

Gunnison Work Started

The county's portion of the funds having been received the commission has authorized the Reynolds Ely Construction company to commence work on the Gunnison-Redmond road, F. A. P. Nos. 56 and 57. Work will begin immediately on the structures of the project including the new bridge over the San Pitch river. The first grading and surfacing work will be done between Gunnison and the sugar factory. Gwynne Lewis, resident engineer, is in charge of this work.

Road Officials Inspect California Highways

Howard C. Means, chief engineer, and Levi Muir, materials engineer of the state road commission, returned June 4 from an investigation in California of the extensive mileage of roads that have been resurfaced in that state. Since the first resurfacing contract on a state road in Utah is to be awarded this summer it was particularly desired to gain first-hand information of the conditions of the resurfacing in California where much concrete pavement originally constructed only four inches thick has proved inadequate to support the great increase in weight and volume of traffic, and a resurfacing program has been under way for a number of years.

The investigation was extended over three counties in Southern California. In Orange county, in particular, the engineers were impressed with the extent of mileage resurfaced and the markedly successful results accomplished under the direction of Mr. McBride, county road engineer. Among roads sustaining an exceptionally heavy traffic which came under their observation were those in and around San Diego, the road to the oil fields and the Ventura Coast route to San Francisco. Leading to the oil fields a road between Signal Hill and Huntington Beach, built originally of 4-inch concrete and resurfaced in 1919 with an additional four inches of the same material is successfully bearing an enormous amount of traffic and the pounding of extremely heavy loads. In all the counties visited, both concrete and bituminous types of resurfacing had been applied over an extensive mileage and with excellent results. Both types were found to be holding up well under heavy traffic and giving good service.

Increase in Road Mileage by States

The mileage of surfaced roads in the United States, including sand-clay, gravel, macadam, as well as those which have been paved, is well over 400,000 miles, according to the bureau of public roads of the United States department of agriculture. At the close of the year 1921 the surfaced mileage was approximately 387,000 miles and 35,000 miles were constructed in 1922. It is believed that the 1923 construction will not fall short of the previous year's record and that by the end of the present year the surfaced mileage will be somewhere near 430,000 miles. This figure, it is believed, makes due allowance for the fact that a portion of the 1922 and 1923 construction consists of the resurfacing of roads reported as surfaced at the beginning of 1922.

Total Mileage and Mileage of Surfaced Roads Outside of Cities and Towns

State	Total Mileage	Miles Surfaced Jan. 1 1922	Miles Surfaced in 1922
Alabama	58,410	10,420	357.9
Arizona	21,227	1,233	413.5
Arkansas	74,866	3,871	872.5
California	75,889	14,275	988.2
Colorado	48,143	4,599	1,630.9
Connecticut	12,152	2,206	167.7
Delaware	3,933	448	79.8
Georgia*	*94,000	*18,000	*1,060.0
Florida	27,643	6,438	437.9
Idaho	31,099	2,982	615.0
Illinois	96,326	11,473	*962.1
Indiana	76,246	39,857	2,435.1
Iowa	104,082	2,585	839.2
Kansas	128,552	1,101	271.0
Kentucky	68,704	15,436	603.0
Louisiana	39,803	2,771	756.0
Maine	21,483	2,953	349.7
Maryland	14,772	3,663	172.4
Massachusetts	18,868	6,575	236.1
Michigan	77,283	17,186	2,570.0
Minnesota	107,103	16,904	2,077.9
Mississippi	53,085	5,744	613.3
Missouri	111,520	7,880	465.7
Montana	64,732	1,772	129.2
Nebraska	86,556	496	160.0
Nevada	26,057	168	81.4
N. Hampshire	13,841	1,691	145.8
New Jersey	14,061	6,505	319.2
New Mexico	45,549	1,802	298.6
New York	81,878	18,566	1,643.5
N. Carolina	68,204	16,755	2,115.9
N. Dakota	106,523	709	143.8
Ohio	84,219	36,067	1,205.0
Oklahoma	134,263	2,461	187.0
Oregon	45,475	8,050	978.5
Pennsylvania	90,991	13,921	942.0
Rhode Island	2,274	753	87.0
S. Carolina	61,850	6,908	548.3
S. Dakota	115,485	548	326.5
Tennessee	62,546	9,878	726.1
Texas	167,685	14,883	2,103.0
Utah	23,047	2,544	442.9
Vermont	14,677	3,545	148.5
Virginia	59,080	7,260	555.0
Washington	45,816	12,061	810.6
W. Virginia	35,173	1,367	191.2
Wisconsin	78,679	19,714	1,958.1
Wyoming	46,528	440	138.1
	2,940,378	387,464	35,360.1

*Data approximately.

Highway Development as It Affects the Farmer

(Continued from Page 10)

the U. S. bureau of education reported 10,500 consolidated schools in the country. This total has been considerably increased since then, as the movement is rapidly gaining in popularity. The resultant educational advantages to the farmers' children are too obvious to require discussion. These consolidated schools are more than mere school buildings. They are community centers where the many splendid principals and superintendents as community leaders are exerting a marked influence in increasing the happiness and well being of the rural families.

The development of the good roads program is breaking down the isolation of the farmer, putting him in touch with the church, amusements, recreation, and his fellow men, thereby adding greatly to the sum total of his happiness. Good roads take the farmer to the city and bring the city dweller out into the country. From this contact comes better acquaintance and a clearer understanding of the problems and needs of each.—Good Roads.

Speed Laws Disregarded

Most states have speed laws, even in rural districts, but average tourists on the highways pay little attention to them.

It is comparatively easy to enforce speed laws in the cities, or even in the smaller towns. Most car drivers make the concession of slowing up when they pass through small towns or villages, whether or not there are any official speed censors in evidence.

But there are other factors besides safety that have compelled state and township authorities to prescribe speed limits in rural districts. The wear and tear on roads from fast driving is one. Concrete highways may stand the strain reasonably well, but the speeding motorist helps to destroy the work of road building where the top dressing is ordinary macadam, gravel or sand.

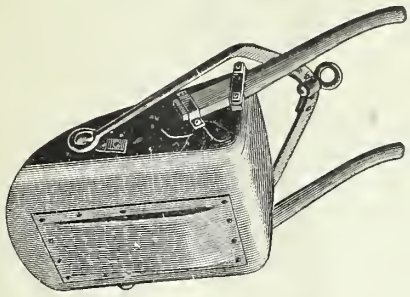
The minister of roads in the Canadian province of Quebec recently offered to resign unless motor car drivers paid more attention to provincial speed laws. He said:

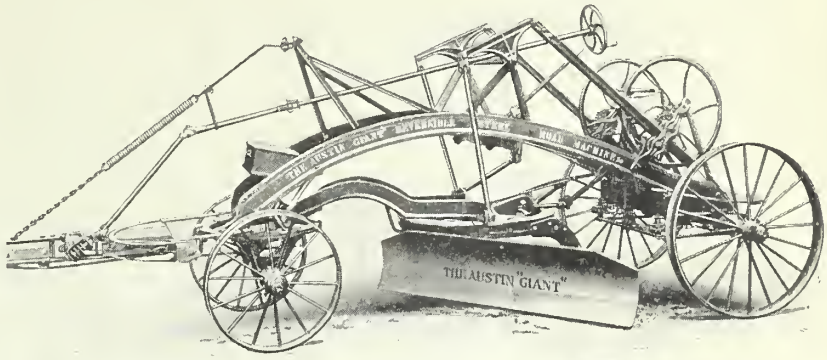
"If the automobile owners do not understsand that the speed limit fixed by the province is reasonable, personally I cannot undertake to maintain the roads. I defy any contractor to maintain 1,500 miles of roads if automobile tourists do not understand that they must not exceed the speed limit."

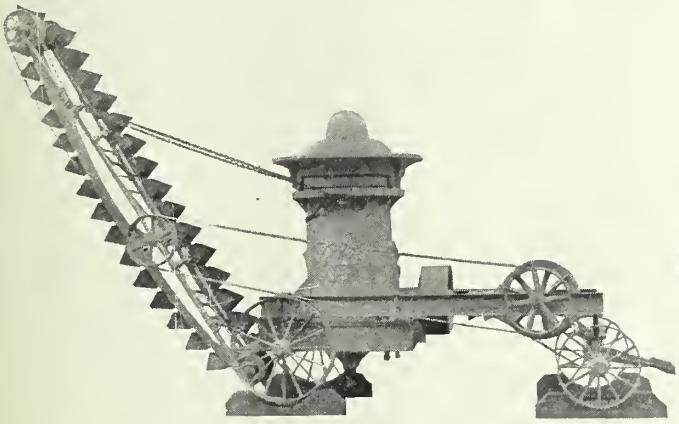
Experts inform us that even the damage caused by automobile trucks is insignificant compared with that caused by pleasure automobiles going at more than thirty miles an hour. On some highways in particular it is said to take twenty-four hours' work to repair the damage caused during one day of auto speeding.

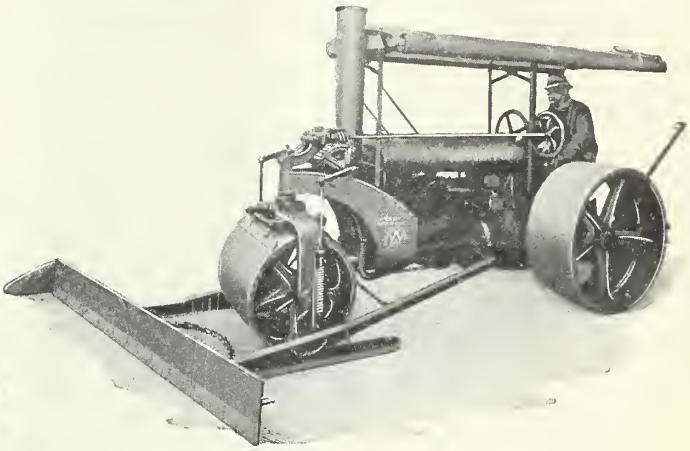
The automobilists are heavily taxed for the building and maintenance of roads, but the authorities in some localities say they get off too cheaply.

The Leading Line of Earth Handling Machinery









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Just the other day, a man in this community said:

"The traffic out this way is too light to justify a Concrete Road."

The answer to this is that any improved highway increases traffic. Frequently it changes light traffic into heavy traffic almost overnight.

That is why it always pays in the end to build Concrete Roads—the roads that stand up indefinitely under the heaviest traffic, practically without repairs.

* * *

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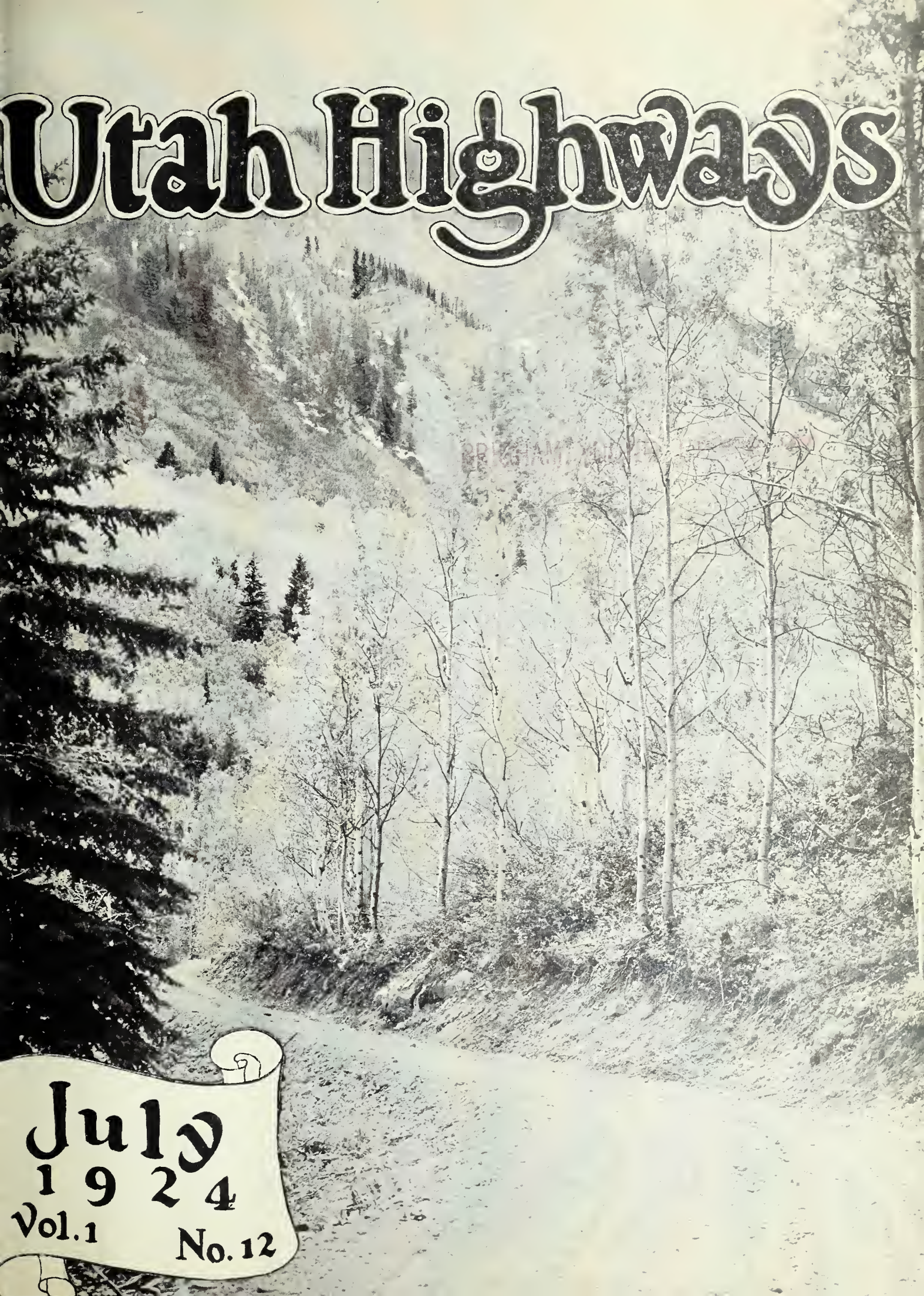
Utah Highways



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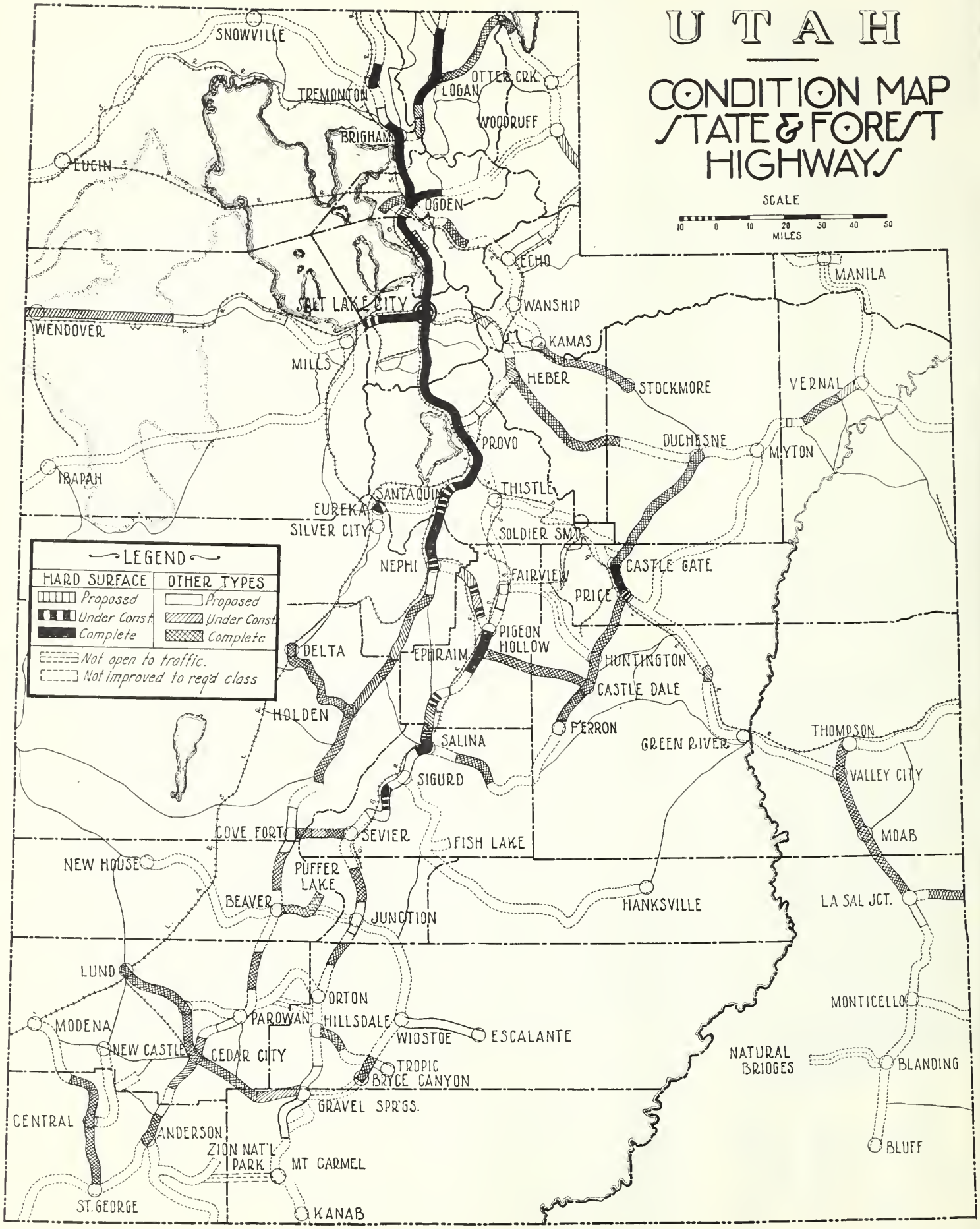

UTAH
CONDITION MAP
STATE & FOREST
HIGHWAYS
SCALE
10 0 10 20 30 40 50
MILES
SNOWVILLE
TREMONTON
LOGAN
OTTER CRK.
WOODRUFF
BRIGHAM
LUCIN
OGDEN
ECHO
MANILA
SALT LAKE CITY
WANSHIP
WENDOVER
KAMAS
MILLS
HEBER
STOCKMORE
VERNAL
PROVO
DUCHESNE
MYTON
IBAPAH
SANTAQUIN
THISTLE
EUREKA
SILVER CITY
SOLDIER SMT.
NEPHI
FAIRVIEW
CASTLE GATE
PRICE
PIGEON HOLLOW
DELTA
EPHRAIM
HUNTINGTON
CASTLE DALE
HOLDEN
FERRON
SALINA
GREEN RIVER
THOMPSON
SIGURD
VALLEY CITY
COVE FORT
SEVIER
FISH LAKE
MOAB
NEW HOUSE
PUFFER LAKE
BEAVER
JUNCTION
HANKSVILLE
LA SAL JCT.
LEGEND
HARD SURFACE
Proposed
Under Const.
Complete
OTHER TYPES
Proposed
Under Const.
Complete
Not open to traffic.
Not improved to reqd class
LUND
ORTON
MONTICELLO
MODENA
PAROWAN
HILLSDALE
WIOSTOE
ESCALANTE
NEW CASTLE
CEDAR CITY
TROPIC
BRYCE CANYON
NATURAL BRIDGES
BLANDING
GRAVEL SPR'GS.
CENTRAL
ANDERSON
ZION NAT'L PARK
MT CARMEL
BLUFF
ST. GEORGE
KANAB

Utah Highways

VOLUME 1. JULY, 1924 Number 12

Origin of the Scenic Wonders of Southern Utah

BY R. E. MARSELL

In this article one of Utah's gifted and public spirited citizens answers with all that science has to say in regard to the how and the why and the when of the fantastic canyons and painted rocks of southern Utah. Himself an enthusiastic explorer and mountain climber, Mr. Marsell has been one of the leaders in founding and popularizing the Wasatch Mountain Club, one of Utah's organized exponents of outdoor life, the purpose of which as stated in the preamble of its constitution is "to encourage outdoor recreation; to unite the energy, interests, and knowledge of students, explorers, and lovers of the mountains of Utah; to collect and disseminate information regarding the Rocky mountains, in behalf of science, literature and art; to explore and picture the scenic wonders of this and surrounding states, and to help in advertising the natural resources and scenic beauties of the state of Utah. To encourage preservation of forests, flowers and natural scenery, as well as wild animal and bird life."

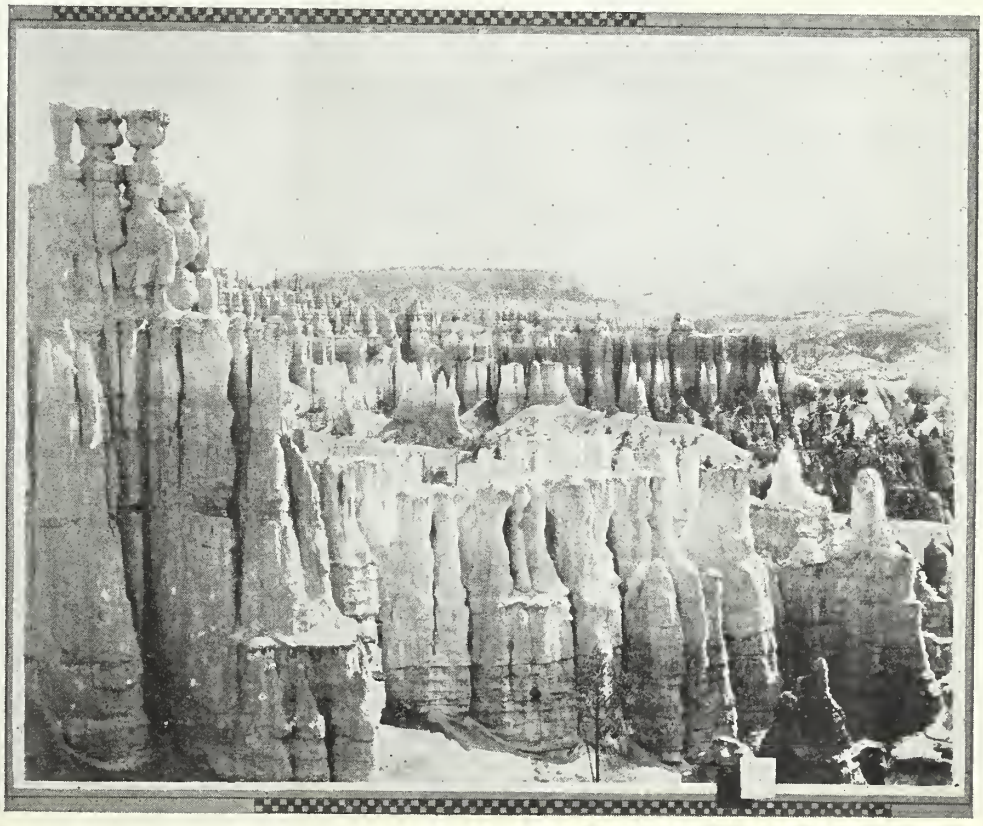
Although the effort is just getting under way to acquaint the world with the beauty of Utah scenery, much already has been accomplished; and inasmuch as good roads are primarily responsible for the success attained thus far, so will the future development of our scenic resources in southern Utah, as well as the economic advancement of that region, depend upon an adequate road building program.

That everyone connected with road building activities recognizes the importance of this matter is evidenced by the road projects recently completed or underway in our scenic regions for the accommodation of the heavy tourist travel that will inevitably result as Scenic Utah becomes more widely known. Particularly noteworthy are the improvements in or near Zion Canyon, Cedar Breaks and Bryce Canyon and the highways which are being built to link together these natural wonders.

Some peculiar problems in highway construction have been met by the road builders in southern Utah, but this is not a strange fact, for this singular region is quite peculiar itself. As a matter of fact, southern Utah is physically quite unlike other scenic districts, and the thing that most appeals to the spectacle-weary public is the fact that it is different.

And why is southern Utah different? The answer to that question is naturally found in the story of the past physical development of the entire region; and although many attempts have been made to describe its special scenic attractions, little effort has been made to explain their origin, to outline the causes and their peculiar effects which we call erosions that have made this region different.

Nature, through the operation of natural fundamental laws, or forces—that geologists call "geological processes"—has here developed throughout the ages some masterful examples of her handiwork on a gigantic scale, painted in a riot of gorgeous colors. The answer to the question why, is of exceptional scientific interest, in fact, no one can view these magnificent examples of rock sculpture without wondering about their origin. This article will attempt to explain why Bryce Canyon and Zion Can-



Bryce Canyon—The White Temple

yon, why Cedar Breaks and the Grand Canyon.

With this thought uppermost in mind let us devote ourselves (1) to a consideration of the present physical aspects of the region, and (2) to an inquiry into those events that in the past have developed its scenic character.

Physiographically the scenic attractions in southern Utah lie in what is known as the plateau and terrace country, a region physically related and a part of the larger plateau province that includes much of the lower half of the state of Utah and the upper half of the state of Arizona. There are few true mountains in the region, and such as occur are of volcanic origin. The plateau country consists of a series of tabular, roughly parallel plateau blocks of huge dimensions that lie in three groups with their major axes trending in a general north-south direction. The westernmost group from north to south is as follows: The Pavant, the Tushar and the Markagunt. The north half of the Tushar is covered by an immense thickness of successive lava flows that have since been eroded into rugged, bristling masses typically serrate and mountainous in character, while the south end is conspicuously tabular. The Markagunt is a true plateau of the normal type, a huge uplifted block of nearly horizontal strata.

The western group of plateaus is separated from the middle group by a long sinuous structural valley which represents a down-faulted or depressed earth block lying between the two groups of uplifted blocks. It is known as the valley of the Sevier, for this stream, the largest in this part of Utah, occupies this valley for the greater part of its course.

The second group of plateaus consists of the Sevier on the north and the Paunsagunt on the south. The Sevier platform is eighty miles long and only twelve to twenty miles wide. The Paunsagunt is a flat-topped mass projecting southward from the Sevier plateau. It cradles the headwaters of the East Fork of Sevier river. Its southern extension is lobe shaped, and the circle of highly colored cliffs that form its rim are known as the Pink Cliffs. They form the first and highest of the terraces to be referred to later. The east rim of the Paunsagunt plateau faces the Paria amphitheatre, another structural trough of imposing dimensions that has been tremendously enlarged by erosion. It embraces an area of approximately nine thousand square miles and it portrays the removal by erosion of an incredible amount of solid rock matter. Its drainage is to the Colorado. Bryce Canyon is but a niche—at most an alcove—eaten back into this east facing rim of the Paunsagunt; such is the majesty, and size, and scale of things in this wonderful plateau country.

The second and third group of plateaus are separated by Grass valley, a trough partly structural and partly erosive, that parallels Sevier valley father west, although at a much higher elevation. The third group of plateaus, four in number, in order from north to south, are as follows: the Wasatch plateau, the Fish Lake plateau, the Awapa plateau, and the Aquarius plateau, the last being the grandest and highest of them all, with an average elevation of eleven thousand six hundred feet.

A small pocket map such as Clason's Auto Guide would materially assist the reader in developing a mental picture of the relative positions and relations of these plateau masses. From the main state highway running south to the Grand Canyon, in the region from Richfield to Kanab these plateau blocks can be readily recognized on either side of Sevier valley. Because they have been greatly modified by erosion since they were uplifted they are often more mountainous than plateau-like in aspect; but when viewed from a peak in the Tushar, or as seen from an eminence on one of the higher plateaus the typical tabular form is easily recognized. The long, level skylines of the horizons are due to this table-like form of the plateaus.

South from the plateaus comes the terrace country, an appendage really of the plateau region. Its form is essentially that of a series of terraces that

(Continued on Page 8)

Zion National Park—Temple of Simawaba

Traveling Over the State Roads As They Were and Are

By MARK TUTTLE, State Auditor

(Our state auditor describes, in retrospect, the remarkable improvement that has taken place in the riding qualities of the roads forming the state road system, beginning in the year in which the state road commission first began operations, and with emphasis on the roads of southern Utah. A comparison of general public interest and one especially encouraging to our road builders.)

A party of tourists, some few years ago, were standing on the north rim of the Grand Canyon and gazing into the chasm with its breath-taking sweep of depth and coloring which sped, beyond the range of vision, to the river a mile beneath their feet, and reappeared again miles away, in terraced mountains. It is not easy to rise to the occasion, even in thought, when standing upon Bright Angel Point, or to refrain from shrinking back from the abyss, but this party was brought back to the hard realities of life by a small girl who piped out shrilly, "Mamma, how long did it take them to dig this out?"

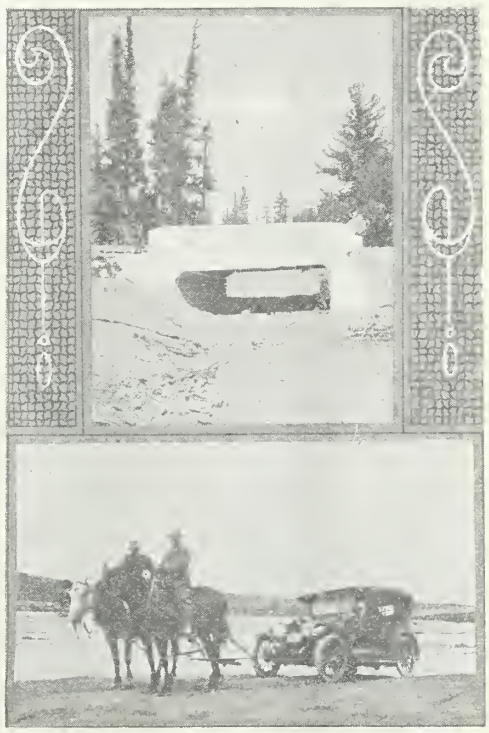
For however long it may have taken, the weary traveller, then, who made his toilsome way over the rough roads to the wonderful erosions of southern Utah, was willing to admit that it probably took that long or longer. And not only those who return again on sight-seeing tours, but the many who live in or whose business takes them periodically into the southern counties of the state can appreciate the wonderful change which has taken place in the condition of the highways in the last few years.

In my official capacity as state auditor, I have recently completed a trip over most of the important highways in the state, and as traveling auditor for the state auditor's office in 1911 it was necessary for me to cover practically the same territory, and the difference in the condition of the highways now and in 1911, in which year the state undertook to improve them, is so marked and is impressed so vividly on my mind, that I am glad to note some of the conditions that were found when traveling at that time.

There were practically no automobiles engaged in public transportation on the state highways in 1911 and all stage travel was made in the old-time stage coach. Between Fillmore and Beaver the roads were unusually rough and if traveling by private conveyance it required an all-day ride. I well remember the sandy and dusty stretch of road between Beaver and Parowan which was well nigh impassable. The road from Parowan to St. George was in no way improved and the sand and rocks made travel most unpleasant. There was no stage line operating between St. George and Kanab and the trip around the "Horn," as it was known at that time, was a very long, hard and tedious journey. The road from Kanab to Marysvale was also much more winding than at present and the numerous rocks and bumps encountered made it two days of hard going to Marysvale and the railroad.

The roads leading into southeastern Utah were also very rough and sandy, and it required the biggest part of a day to go from Thompson to Moab. From Moab to Monticello it was an unusually tiresome and dusty trip; leaving Moab between three and four o'clock in the morning it was usually after dark before reaching Monticello. I remember the stage driver on the stage between Moab and Monticello quitting his job with the remark that the proprietor of the stage line had promised him steady work and he said he had found it so steady that there was only two or three hours out of the twenty-four in which he was not busy and he therefore tendered his resignation. An old Wells-Fargo coach was run between Price and Vernal by way of Myton and any person who has bounced around in one of those old-fashioned vehicles for twenty-four hours with the horses toiling up the dusty slopes and many times galloping down them would not have the slightest desire to return to the old conditions.

At the present time there is a splendid system of highways extending, with one or two short stretches which are now under construction, from Logan to the foot of the Black Ridge in Washington county and it is not unusual for motorists to travel from Salt Lake City to St. George in one day. The highway from St. George to Kanab has also been shortened and rebuilt until now travelers make this trip in half a day. The Grand Canyon highway between Kanab and Richfield has also been greatly improved, the road has been shortened, sandy places have been graveled and much of this mileage has been reconstructed to federal-aid standards. Personally I am a booster for the standard as fixed by the bureau of public roads for the construction of our trunk-line system. One can easily tell where these projects commence and end and while it may seem at first that the cost is somewhat prohibitive it certainly is a great pleasure to travel over them. The sixty miles of road between Thompson and La Sal Junction was a federal aid project and is unquestionably one of the best constructed highways in the state of Utah. The speed that can be maintained over this strip of road is only limited by the nerve of the driver and the racing qualities of his automobile.



An assisted tour of Southern Utah in 1915, and (above) type of permanent bridges now being built. Both scenes in Garfield county

There is yet a stretch of approximately twenty miles between the terminus of this federal aid road and the foot of Peter's Hill in San Juan county which is under improvement and reminds me of the conditions of this highway when I first traveled it. While driving over this stretch of road, I was caught in a severe sand storm which filled the ruts with heavy red sand and made the already bad roads well nigh impassable. On six different occasions it was necessary for me to get out and deflate my tires to approximately one-fourth of their capacity in order that traction might be increased sufficiently to pull over these sandy stretches. On account of the limited wealth of San Juan county, it is practically impossible for them to raise funds sufficient to meet their part of the cost of improving this road and if the state can find ways and means to assist them it will be money well spent.

It is not easy to figure the returns in dollars and cents from good roads but there is one thing I can vouch for and that is that the saving of gasoline, and wear on the tires of an automobile in one single trip of several hundred miles is sufficient to pay the automobile license and gasoline tax for the entire year, and in addition you have the pleasure of riding over a highway which does not deprive you of all of the pleasure of the trip. I have noted, too, the great saving in time which good highways effect and it is a pleasant surprise to find that each year now takes off a day or two from the total time elapsed between leaving Salt Lake and return.

We are all familiar with the splendid system of paved highways through the central and more populous counties of the state and I am heartily in accord with the policy of the state road commission that what we need now is a greater mileage of standard gravel sur-

(Continued on Page 5)

The Advantage of Gravel Roads for Utah

By E. C. KNOWLTON, Assistant Engineer.

To build the best possible gravel roads and to maintain them properly under the disintegrating effects of automobile traffic is the big problem before the road building officials of this and other western states, and for years to come the extension of our gravel surface mileage will be by far the most important factor in each year's program.

During the period from 1917 to 1922 our efforts were concentrated mainly upon the construction of hard surface roads. It was during this time that the $7,000,000 bond issue was raised and spent and the major portion of this large sum was used in building paved roads. Data secured from traffic censuses throughout the country point to the conclusion that a road which does not exceed an average of 500 vehicles per day does not require hard surfacing from the standpoint of sound economics. It is quite certain that very little of our trunk line mileage now carries a traffic in excess of 500 vehicles per day which has not been paved. There can be no question then of the soundness of the policy of the present commission in adopting a program of gravel surfacing, notwithstanding the opposition which has arisen from some sources against the change. It certainly is a fundamental principle that the function of the road building officials of any state is not merely to supervise the proper construction of roads, but to plan a program which comprehends the improvement of the entire system. If the policy of building chiefly hard surfaced roads had been retained in this state, the roads through the central and wealthies counties would soon all be paved, while the traffic over the larger mileage in the outlying counties would be left to flounder in the mud.

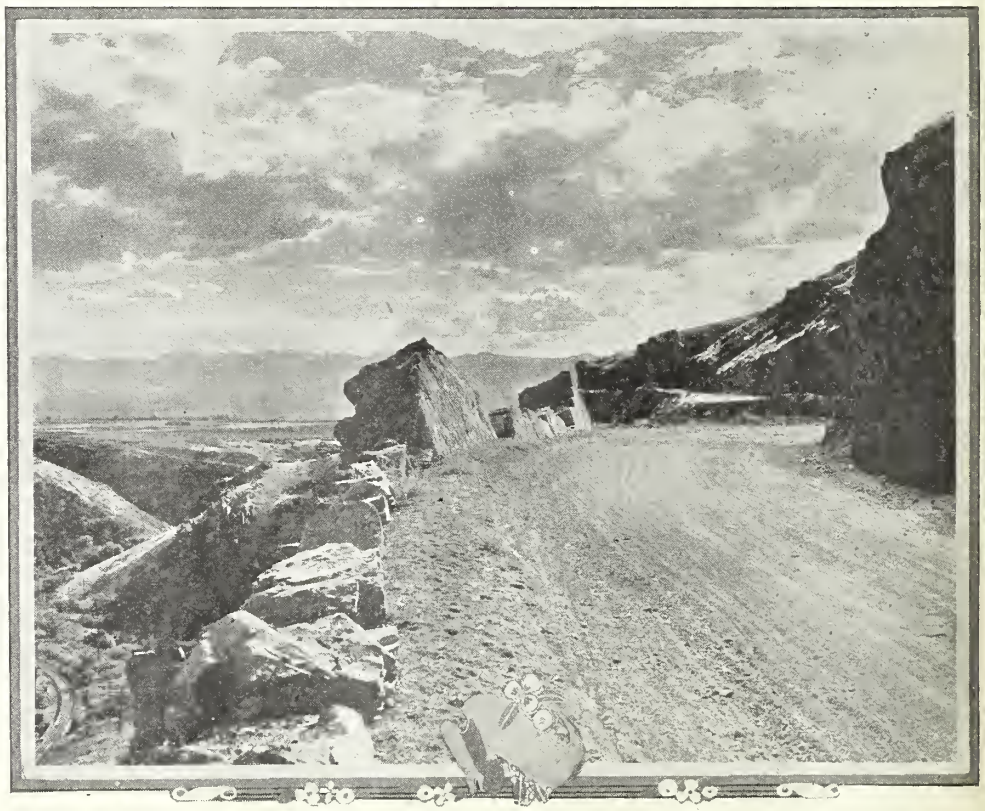
The great advantage of building gravel roads is that it provides the quickest and most effective way of getting a maximum mileage of road in such shape that it is suitable for all-year traffic. In other words, due to the small cost as compared to pavement, the available funds can be spread out over a much larger mileage. The cost of grading, building bridges and installing minor drainage structures is about the same for either type of road. This cost, in open country, is around $4,000 a mile and may run as high as $20,000 per mile and occasionally higher in the construction of canyon roads. The cost of application of six inches of gravel surfacing eighteen feet wide also averages $4,000 per mile and the average cost throughout the state of a paving slab of the same thickness and width is $28,000 per mile. Our gravel roads are built with the probability in mind of future paving, the same considerations as to grade and alignment being given as though a pavement were to be immediately placed, and a further advantage of the gravel road is that during the period of its life the road bed becomes thoroughly compacted and the capping of gravel forms a perfect base for the future pavement.

Constant Maintenance Essential.

It is to the gravel road particularly that the truism applies: "Eternal maintenance is the price of good roads." The fundamental difference between a gravel and a hard surface road being that the component materials of the pavement form a comparatively fixed surface which does not change materially from the effects of traffic and weathering over a period of years, while the gravel road, depending upon natural materials for its binding qualities, deteriorates rapidly under traffic, particularly from the effects of a heavy traffic in early spring. Also the wear on the surface of a gravel road from the abrasive action of approximately 500 vehicles per day means that at least 200 cubic yards of new material must be added each year for every mile of road. With this fact in mind it is evident that conservation is a matter worthy of attention and consideration is now given to this point, both during construction and following. Until recently in the construction of our gravel roads, the contractors have been allowed to waste large quantities of oversize and undersize material. By requiring crushing, which is now generally done, this evil is overcome and thus large quantities of waste materials are not piled up with their value as road materials greatly lessened. The ideal surface of a gravel road is very different from that of a pavement, in that the pavement presents a hard, smooth surface, while the proper gravel road should always have a thin layer of fine material loose upon the surface. This loose material prevents the washboard or chatterbox effect which is the great bugbear of the gravel road surface, for when irregularities or low places form, water settles in them causing soft spots and the traffic tends to dip them deeper. If this condition be allowed to continue, it would not be long before the road surface would be worn through at such points.

It is, therefore, necessary to continually haul new material upon the gravel surfaced road in order to retain this loose layer which, as it gradually incorporates with the compacted road, replaces that portion worn away. Even in dry weather this loose material should be dragged into the worn tracks of travel in order to force the traffic to run over the entire road surface and thus prevent a concentration or wearing on one portion of the roadway. In the spring the section upon which the surface has become misplaced by heavy traffic or frost action, should be lightly scarified, and then the original crowned surface again rebuilt.

Assuming that a cost of placing 200 cubic yards of material is $1.50 per cubic yard, it will require $300 per mile for



Parley's Canyon at entrance to Great Salt Lake valley. Gravel and shale road carrying heavy local traffic and route of both Lincoln and Victory highways

new material on the typical gravel road every year. Adding $100 to this for labor in dragging, clearing snow in winter and other incidental work, gives a total of $400 per mile, which is the average requirement for a gravel road carrying heavy traffic. We are attempting in this state to maintain our gravel roads on the maximum of $200 per mile. As the average traffic on most of them is a great deal under 500 vehicles per day, this average figure should admit for the present of satisfactory maintenance, but we must expect to spend not less than $400 per mile when the increased traffic of the next few years shall come upon them. Although this appears rather a high figure such a sum is easily justified when we consider the difference in original cost of gravel and pavement. The difference in favor of the gravel is $24,000 per mile built which, figuring the interest at 5 per cent, amounts to $1200 annually. There is, of course, considerable saving in traffic costs of pavement over gravel surface, but even taking that into account it is plainly seen that $500 per mile for maintenance is well justified where the traffic is not too heavy for the road to carry.

Adding greatly to the cost of maintenance is the dust nuisance which is especially obnoxious where homes line the highway. Where traffic on a gravel road exceeds 500 vehicles per day, the average road of this type cannot withstand the traffic without an application of some material such as oil, tar, or calcium chloride. A treatment of this kind not only acts as a dust layer but preserves the gravel surface greatly, and at the present time there is a limited mileage in the state where some such treatment is demanded in order that the road may sustain the traffic.

Pipe Springs Has Unique Place in Utah History

A historic building on a site at which good water could be had in the early days for both man and beast and which now supplies that vital fluid to both man and car is shown in the accompanying cut of the old stone house at Pipe Springs. It is situated about 8 miles south of the state line in Arizona on the road between La Verkin and Fredonia. Like Cove Fort this structure was erected to replace the original log dwelling in order to furnish a greater degree of safety from roving bands of Utes and Navajos that frequently made life troublesome and sometimes were elements of extreme danger to settlers.

Old stone buildings at Pipe Springs

The springs were first selected as a site for the headquarters of a cattle ranch in 1863 by James M. Whitmore, who with his foreman, Robert McIntire, was killed by Indians in 1866. Following this tragedy and the pursuit and chastisement of the Indians by militia from the little settlement of St. George, the stone buildings were erected. The place was for a time known as Winsor Castle from the name of the cattle company which acquired the property after Whitmore's death. The name Pipe Springs was given, however, in a baptism of fire and consequently still holds. A party of scouts had been out picking up the trail of some marauding Indians and upon their return stopped at Winsor Castle. Some question being raised as to the marksmanship of one of their number, the man whose skill or lack of it was the subject of discussion, took a dare, proved his ability and settled the argument all at once by shooting to pieces the pipe of one of the party who happened to be smoking at the time.

In 1870 this frontier post became a station on the telegraph line of the Deseret Telegraph company which that year built from Rockville and around the point of the mountain in Arizona to Kanab.

Traveling Over the State Roads as They Were and Are

(Continued from Page 3)

faced highways rather than an extension of our paved roads. I think it is our duty to carefully watch the expenditure made for highway purposes and get full value for every dollar expended. I can think of no more worthy purpose, however, for the expenditure of public funds, unless it be for education, than for the construction of good highways within our state. I feel that it will pay us dividends much more than the cost of the expenditure.

Having personally visited most of the wonderful scenic attractions of our state, including the Kaibab forest and the north limit of the Grand Canyon, I feel it is the duty of every loyal citizen who can afford it to make this trip. It will make us all better citizens to interest people from other states in visiting us and in seeing for themselves the wonderful scenery within or near our borders. Upon a recent trip from Loa to Emery county I traveled over splendid highways recently constructed by the counties of Emery and Wayne. The view from the high divide north of Loa looking east over the painted desert to the La Sal and Henry mountains is magnificent, the wonderful and fantastic shapes of the rocks is a scene never to be forgotten. The desert is truly a marvel, the large rocks stand out in the most impressive and weird shapes and you can plainly see the La Sal, Henry and Blue mountains from this point. When the beauty of this scenery becomes generally known, it will add another to our wonderful scenic attractions for which Utah is already famous.

Grand Junction-Vernal Road Open to Traffic

The Grand Junction-Vernal road into the Uintah basin via Rangely is now complete and opened to traffic, the Vernal Express noting that the first bus on the new auto stage line from Grand Junction arrived Monday, June 16, on an announced schedule carrying six passengers on the initial trip while trucks brought in 7000 pounds of freight for basin merchants.

State forces began laying the 0.7 mile of native asphalt paving in the main street of Vernal the first of July with Frank Allen superintendent. Levi Muir, materials engineer, reports some construction difficulties encountered in getting the work under way but these have been successfully ironed out and the work will probably be finished in July.

Automobiles Cheaper Than Whisky

It is common to wonder where the people get all their money to buy and run automobiles. A statistician comes forward with a statement that we are spending less money for and on automobiles in this country than we used to spend for whisky. Which speaks well for the people. Automobiles are responsible for a lot of accidents, of course, but whisky used to wreck more lives and more homes in a week than autos would in a generation.—Nevada Highway News.

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Utah Highways

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H. V. RICHARDS, Editor

THIS MONTH'S COVER PICTURE

Our July issue, with which we complete the first year of UTAH HIGHWAYS, shows on the front cover a portion of the Alpine Scenic highway, the new forest highway which surmounts the divide between American Fork and Provo canyons, this view showing the road winding to the summit above the North Fork of the Provo. Beginning in American Fork canyon, the favored side from which to make the ascent for a pleasure drive, the road encircles the easterly slopes of Mount Timpanogos, highest peak of the Wasatch range, to the divide, then drops to Aspen Grove on the Provo side by way of North Fork. The opening of this road to traffic by the forest service last summer marks the completion of the first unit of a series of connecting mountain roads which will loop together five of the canyon roads entering the Wasatch mountains from the forty-five miles of paved state road between Salt Lake City and Provo. When completed the road will lead from the state highway in Parley's canyon east of Salt Lake City, and thence south over the first summit to Brighton in Big Cottonwood canyon, then to Wasatch in Little Cottonwood and from there to American Fork canyon and the completed loop.

KEEPING UP WITH OUR ROAD BOOSTERS

Some criticism has from time to time made the rounds of the press and has recently reappeared condemning the policy of Utah in not improving more rapidly the main highways in the eastern part of the state, the Salt Lake-Evanston, the Uintah basin road, and the Midland Trail through Price. All of these roads form a part of our federal-aid system and carrying, as they all do, an important interstate traffic, there can be no question but that the best interests of Utah require that these roads be improved to a point where they are at least on a par with our main north and south highways which are rapidly attaining a high standard of excellence.

In answer to the objections to the state's road policy that are now being made we can do little but reiterate what has been previously said in these columns. The state road commission is naturally held responsible for the administration of our system of state highways; if it is a state highway, then the state is expected to look after it, of course, and yet the fact remains that on all of these highways except where they extend through a national forest or other federal reservation, the progress of construction is largely a matter of local support. With the absorption, in 1921, of the last of the funds derived from state road bond issues in highway construction contracts the commission became entirely dependent upon such funds as each county might raise for the maintenance of the state roads within its limits and for the state's share of the cost of federal-aid projects.

This condition was improved to some extent by the 1923 legislature which appropriated, from the excess funds accruing from the motor vehicle tax, $181,000 to be used as a revolving fund, the purpose of this fund being to permit the commission to meet its contractural obligations promptly and honor estimate invoices on federal aid construction without compelling contractors to wait until vouchers were approved and paid by the federal government. Another and even more important enactment was that of the gasoline tax law, the revenue from which, aside from meeting the annual burden of interest and redemption payments on $7,000,000 of road bonds, is this year enabling the commission to pay half of the maintenance expenditures on the state highway system and with every indication that 1924 receipts will admit of 100 per cent upkeep by the state next year. It is well to note in this connection that the law does not permit the use of gas tax funds for construction purposes, their use being restricted to maintenance only. The state continues to worry along without any general fund for road construction, and nearly every project that comes up for consideration presents its own peculiar problems of financing.

It is fortunate, in view of the present situation, that a very general accord exists between state and county road officials and that the commission has behind it the whole-hearted support of the public in building good roads. There is no need in Utah to argue for the advantages of lifting communities out of the mud, for all the state wants better roads, more roads and wants them now. The desire of the more populous counties for paved roads would not leave enough federal aid to go around if all the requests for hard surfacing were granted. The counties with the longest road mileage and scantiest population, and this applies particularly to the counties along the eastern border of the state, have done and are doing all that could reasonably be expected, and more, to finance highway improvements but are quite unable to maintain a satisfactory rate of progress, even with federal assistance at the rate of nearly three dollars for every dollar raised by the county.

The obvious remedy for relief from a situation which is causing such general dissatisfaction is a change in the concept of the state road law whereby a state road, even though it be a primary federal highway, is only a county road insofar as the method of raising funds for its reconstruction is concerned.

ROAD FACTS

One of the factors retarding road development is lack of appreciation of the modern science of highway building and using.

We know too many things about roads which are not so!

Many of our highway ideas are twenty years behind the times. We haven't caught up with the engineer.

For instance, "all roads wear out. The enormous money invested in them is thus a capital loss."

Roads do not wear out. The surface of a good road wears, of course. So does the roof of a house. But replacing the house roof doesn't mean that the rest of the house isn't good. The surface of a road is its roof. If it wears out it must be replaced. But that doesn't mean that the right of way, the grade, foundation, and all the material is any less valuable than at first.

"There isn't money enough to pay for national highways. We will all be bankrupts!" More fallacy. There were 4,087,000 motor cars produced in 1923, a 22.5% growth over 1922, and with a wholesale value of $2,252,000,000. Did we get bankrupt buying them? We did not! Why should we get bankrupt buying seven billion dollars worth of roads . . . and the interest on seven billions will build today more national highways than we have as yet engineers and machinery to build.

Transportation has been, for us Americans, nothing but rail and water for all history. Now we are compelled to translate the word into "highways" and "motors." Motors we understand . . . highways, as yet, we only partially comprehend, and "motor transport," as a whole, is yet a sealed book to most of us.

The first step in opening it is to get rid of fallacious thinking . . . to realize that what used to be, is no more true today, than what is proper road width and cost today will fit conditions fifty, a hundred years hence!—Exchange.

Vacation Time Makes Busy Season for Fish and Game Department

By DAVID H. MADSEN, State Fish and Game Commissioner

The Jordan river near Salt Lake City

The good roads movement has become so general throughout the country that there is now scarcely a lake or stream of importance in any state that is not readily accessible by automobile. This means that there are now few new or isolated places where the sportsmen can go in quest of fish or game. It calls for a new and enlarged program of conserving and restocking of our wild life areas, and strict law enforcement during both closed and open seasons in order that there may be fish and game for the public at vacation time.

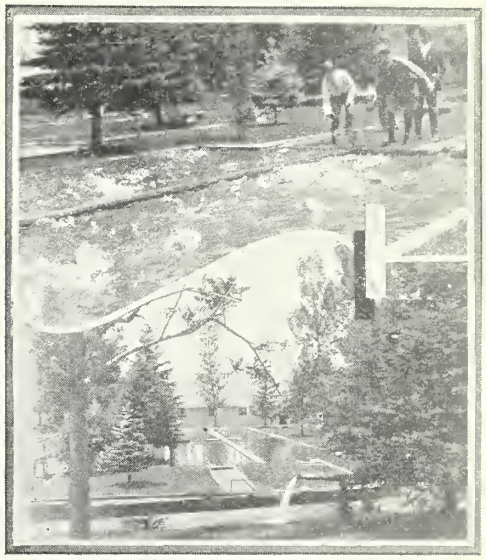
Since there are no new places to go fishing, we are compelled to make old fishing places new by restocking. For a long time the American people have been pioneering, bringing the far places under cultivation and control, and the out-of-doors man has gone farther and farther, utilizing our native supply of wild life, as civilization advanced, never giving thought of the time when the last virgin stream would be fished out and the last forest opened up to gun and dog. It was generally taken for granted that game disappeared with the advent of civilization and that when it was gone the story would be finished. Like many of our foolish notions this theory has no foundation in fact. The awakening of public interest for the protection of game has resulted in an increase of all kinds of wild life in some of our most populous states. In fact it is quite apparent that game increases in close proximity to large cities where there is a strong sentiment for protection much more rapidly than in sparsely settled districts where there is no respect for game laws and no constructive methods of restocking.

Believing that good roads and good fishing are possible within the boundaries of our state, the fish and game department has mapped out a campaign of restocking with millions of fingerling trout that will embrace every lake and stream in Utah adapted to the purpose. The department has the backing, in this move, of almost our entire citizenship. Everyone admits that good roads are used to a considerable extent as a means of securing pleasure and recreation for all of our citizens. The man and his family enjoy together the delightful summer drives into our canyons, for camping and sight seeing. And what greater attraction could we have for the real out-of-doors man, woman or boy than a well stocked trout stream?

Utah is operating seven large fish hatcheries, located advantageously throughout the state, in order to conveniently reach all of our important lakes and streams. Last year we planted nearly one thousand truck loads, (25,000 cans) of trout fry and fingerling. This year our output will be increased by nearly fifty per cent. This program must be continued and enlarged from year to year in order to meet the demand for fishing.

On June 15th, this year, it is safe to say that 50,000 citizens of Utah were camped along our streams and lakes, fishing, or at least participating in the result of the efforts of some member of the family who was fishing. If ten fish were taken by each individual, (and that is perhaps a conservative estimate), it will be seen that a half-million fish were taken the first day; more than would have been caught in an entire season ten or twenty years ago. This goes on, in a somewhat smaller way, for five and one-half months every year. No wonder we are compelled to raise our sights and produce more fish. This means, too, that perhaps fifteen thousand automobiles drove hundreds of miles to go fishing on June 15th, over our splendid system of state highways; and reminds us that our citizens are demanding all of these modern conveniences as a part of American citizenship.

The fish and game department is also operating a game farm from which four thousand birds are liberated annually. With proper protection there is no reason why our wild life resources cannot be built up so that the surplus each year may be sufficient to take care of our actual needs, furnish us with the incentive to go out and enjoy our wonderful out-of-door resources, fish and hunt within reason, and still leave a breeding stock of wild life sufficient to provide like privileges for those who come after us.



Scenes at State Hatchery No. 1; above, stock trout enjoying breakfast

Salt Lake County Adding to Paved Mileage

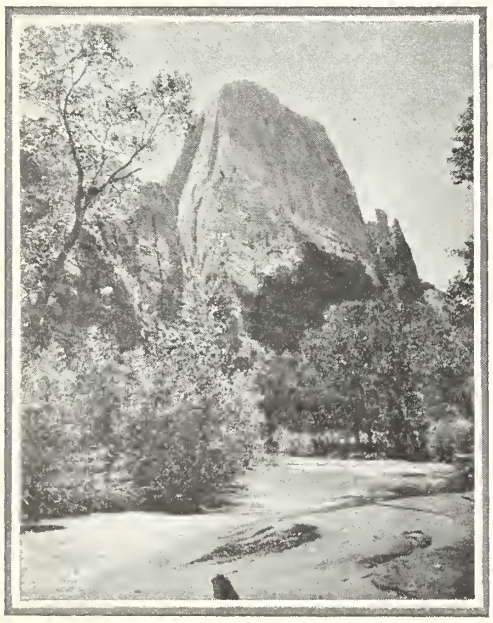
The subgrade has been prepared for paving the half mile strip between Magna and the federal aid project which extends to the Tooele county line. This is the only unpaved portion in the county of the state road west of Salt Lake City and will be rushed to completion, according to E. L. Burgon, chairman of the county commission, who is in charge of the road department. Ground is now being broken and the public detoured from the four-mile county paving project from the end of the existing pavement beyond Welby, to the mouth of Bingham canyon. The Moran Paving Co. are the contractors.

Origin of the Scenic Wonders of Southern Utah

(Continued from Page 2)

lead down, step by step, to the level platforms of the Kanab and Kaibab plateaus that form the north rim of the Grand Canyon. The riser of the top step is formed by the steeply eroded cliff faces of the edges of pink strata of Eocene, Lower Tertiary age,—the Pink Cliff formation. Next below comes a succession of minor slopes and terraces embracing the whole Cretaceous system consisting of iron-gray to olive-green shales and buff to yellow sandstones. The shales are soft and erode into slopes; the sandstones are harder and more massive and form cliffs. These are typical topographic forms in an arid climate where essentially horizontal rocks of varying hardness are being eroded. The riser for the second step is carved from the massive pale gray to white Jurassic sandstone, the White Cliff formation; and at the base of the series lies the gorgeous palisade of the Vermillion Cliff formation of Upper Triassic age. A sunset on these massive terraces—involving a vertical height of over four thousand feet—as viewed from the Arizona desert, southeast from Kanab, is a sight that would kindle enthusiasm in even the dullest mind.

The earth's crust in the plateau region is composed of nearly horizontal layers of sedimentary strata. A simple analogy would be to liken it to an immense layer cake many thousands of feet in vertical thickness. The layers at the bottom, as displayed in the gorge of the Grand Canyon, are excessively hard and crystalline, the layers next in order from the bottom up form a vast series of alternating, massive and compact limestones and sandstones, and softer shales. These formations range in age from Cambrian up through the Carboniferous to and including the Kaibab limestone. of Permian age that floors the Kaibab platform and forms the upper rim of the Grand Canyon. The remaining layers of our cake, those previously mentioned as forming the terraces and plateaus, are



El Gobernador—Zion Park

Bright Angel Point—Grand Canyon

made up of successively younger and less well compacted rocks up to the pink marly limestones of Tertiary age that are hardly compacted at all. Their clay-like softness is responsible for their fantastic and grotesque erosional forms, aided by the solubility of the lime that forms a large part of the rock. Bryce Canyon and Cedar Breaks are both the result of unusual erosional development in these soft sediments of the Pink Cliff formation, as these Tertiary rocks are called, particularly those displayed around the rim of the Paunsagunt plateau. For the sake of completeness we might include as frosting on our cake the massive layers of chocolate-colored basalt and other lava rocks that have been outpoured upon its surface.

But let us not let our fondness for simple analogies lead us too far, for no cake-loving boy with the wildest of imaginations could have dreamed of a cake of such vast proportions. From the top step to the bottom of the terrace is a distance of nearly fifty miles. It is eighty miles across the Kaibab platform from the Vermillion terrace to the brink of the Grand Canyon, and that vast abyss, that colossus of canyons, is a mile deep and several miles wide from rim to rim.

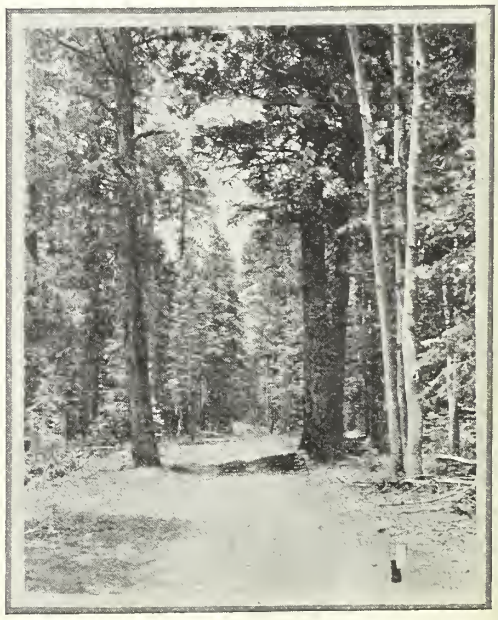
In order to more readily understand and appreciate the factors that throughout the ages have been responsible for the creation and development of these sublime masterpieces of rock sculpture we must familiarize ourselves with a brief outline of the past physical history of the entire plateau province in which the formation of our scenic wonders is but a relatively recent chapter in a book as yet unwritten, but whose pages already tell a story that goes back through unthinkable eons to the very dawn of geologic history.

That there has been a complete reversal of conditions here in the plateau province in a recent geologic epoch is perhaps the first and most significant fact afforded us as we contemplate the past physical history of the region. Today it lies at an average elevation of perhaps seven thousand feet above sea level, but during most of the earlier periods of geologic history it remained actually below sea level where it accumulated those vast thicknesses of sediments that have since become gneisses and schists, limestones, sandstones, and shales that make up the formations of metamorphic and sedimentary strata heretofore referred to. In age, from the bottom up, the formations are as follows: Archean, Algonkian, Cambrian, Devonian, Mississippian, Pennsylvanian, Permian, Triassic, Jurassic, and Cretaceous. These rocks involve a total thickness of over forty thousand feet, and the time necessary for their accumulation is infinitely beyond human comprehension. That it must be reckoned in millions, if not billions of years, is readily admitted.

North America was widely flooded many times during this vast time interval, and the region in question was one of exceptional and persistent submergence. That there was considerable oscillation is indicated by the varying strata; and the actual emergence of the land as a low desert area in Jurassic time is indicated by the highly cross-bedded White Cliff sandstone which is thought to consist of wind-blown sands of dune origin. The youngest sediments in the area, the Bryce Canyon "Pink Cliff" formation of Tertiary age, are non-marine in origin. They formed on the bottom of a vast fresh-water lake that covered the region following the final withdrawal of the sea at the end of the Cretaceous period. After the final desiccation of the lake a period of uplift began that caused the general elevation of the plateau province and the basin province to the west as well, although the latter area had been a land mass upraised above the sea and undergoing erosion for the greater part of the Mesozoic era.

Extensive volcanic activity closely followed or accompanied this period of uplift and thousands of feet of successive lava flows covered extensive areas in the plateau and basin provinces. These lava rocks are well displayed in the Fish Lake, Sevier, and Tushar plateaus.

The transfer of so great a volume of material from the earth's interior to its surface may in part have been responsible for the widespread fracturing and differential subsidence which followed. Along the dividing line between the basin and plateau provinces the earth's crust broke up into a series of irregular blocks that during the unequal setting of the entire region came to stand up at a considerably higher elevation than the basin region to the west. The ir-



Road through Kaibab forest, Grand Canyon highway

regular settling of these plateau blocks caused some areas (the depressed blocks or troughs) to be lower than others. Immediately the agencies of erosion attacked the exposed edges of the higher blocks, depositing the resulting detritus on the lower blocks, and producing the broad flat intermountain valleys.

Bryce Canyon, Cedar Breaks and to a great extent Zion Canyon and the Grand Canyon are the result of erosive forces directed against the exposed edges of the nearly horizontal sediments that make up the plateau blocks. Down-cutting and removal by stream erosion has been the most important element in the development of Zion Canyon and the Grand Canyon. In fact, innumerable gullies, ravines and gorges have been etched out in the plateau masses by erosion since they first developed any pronounced inequalities of elevation. This accounts for their somewhat mountainous aspect when viewed from below.

The degradation of the plateaus by the immutable forces of nature proceeds today much as ever. Already the processes of erosion on a staggering scale have disintegrated and removed a vast, almost unbelievable, amount of rock waste from the plateau province. As an example the group of Mesozoic and Cenozoic rocks consisting of the Triassic, Jurassic, Cretaceous and Tertiary systems, a thickness of thousands of feet of solid rock, has been dissipated, swept away, and entirely removed from an area embracing thousands of square miles in the Grand Canyon region alone. It seems well nigh incredible, yet it is true; and if these same processes are allowed to go on uninterrupted during the eons to come they will eventually level the entire region to a featureless plain, which may again be submerged by the ever restless sea.

Improvement Finished on Price Canyon Highway

The Price canyon cut-off between Price and Soldier Summit has recently been completed under the direction of Ed C. Lee, state road agent in Carbon county. Mr. Lee resurrected and placed in commission a steam shovel which had become tired and quit after digging cut about three-quarters of a mile of this canyon road several years ago and the work has progressed steadily since last fall to its recent completion. Forty thousand dollars was budgeted by the county as the minimum under which this road could be widened sufficiently to make it safe for traffic but an excellent job has been done at less than the estimated cost and in addition several miles of guard rail have been erected, using some 3800 cedar posts cut in Spring canyon, and discarded mine cables from various camps in the district. In addition to the Price canyon work Mr. Lee has also completed under a betterment order six miles of widening and gravel surfacing in the southern part of Cat canyon and extending to Sunnyside junction. This road, formed principally of a blue clay, very slippery and dangerous in wet weather, has been adequately surfaced and otherwise improved and constitutes another notable improvement of the state roads in Carbon county.

SPARKS from the Road Drag

No Supper Tomorrow!

The patter of tiny feet was heard on the stairs, and Mrs. Blank raised her hand for stillness among the members of her bridge club.

"The babies are going to give me their good-night messages," she whispered.

"Listen! It always gives me a feeling of reverence."

The silence was intense as they all listened. "Mama," came the shrill whisper, "Johnnie found a bed bug."

Dangerous Occupation

Old Gentleman (engaging a new chauffeur): "I suppose I can write to your last employer for your character?"

Chauffeur: "I'm sorry to say, sir, each of the last two gentlemen I have been with died in my service."—The Exhaust.

Gates Ajar

"Is this the speedometer?" she asked, as she tapped on the glass which covered that instrument.

"Yes, dear," I replied in a sweet, gentle voice.

"Don't they call this the dashlight?" she queried, fingering the little nickel-plated illuminator.

"Yes, honey." My words floated out softly as before.

"And this is the cutout?" she inquired.

"Yes, toodles," as I took my foot off the accelerator. Not more than 200 feet away our course was blocked by a fast moving freight train.

"But what on earth is this funny looking pedal?" she said in a curious tone, as she gave the accelerator a vigorous push with her dainty foot.

"This, sweetheart, is Heaven," I said in a soft, celestion voice, as I picked up a golden harp and flew away.—The Highway Magazine.

GRAY'S ELEGY, UP-TO-DATE

The klaxon sounds the knell of parting day,
Some late arrivals through the dust clouds creep
And three hours after we have hit the hay
The noise calms down so we can go to sleep.

Save where, from yonder pennant-clad sedan
The radio set emits its raucous squeal,
And underneath a near-by light, a man
Pounds until daylight on a busted wheel.

Beneath those tattered tops, those patent tents,
Where falls the dust into each sunburned pore,
Each on his folding bed of slight expense
The rude explorers of the highway snore.

Let not ambition mock their creaky cars,
Their khaki clothes of vintages obscure,
Nor grandeur view, with hauteur like a czar's,
The short and simple flivvers of the poor.

The boats of shiny paints, the pomp of power
And all that charms the motoristic fop,
Await alike the inevitable hour—
The paths of touring lead but to the shop.

Can streamline hood or silver-plated hubs
Back to its mansion call the missing spark?
Can plush upholstery foil the clummy dubs
Who bang into your fenders in the dark?

Full many a boob of purest ray serene
Succumbs each summer to the touring itch;
Full many a car is doomed to blush unseen
And waste its sweetness in a western ditch.

—Spokane (Wash.) Spokesman-Review.

Hotel Clerk—"Why, how did you get here?"

Hard Egg—"I just blew in from Montana with a bunch of cattle."

Hotel Clerk—"Well, where are the rest of them?"

Hard Egg—"Down at the stockade. I ain't as particular as they are.—Yellow Jacket.

RULES OF THE ROAD IN JAPAN

(As translated from Japanese traffic regulations by Michigan Roads and Pavements.)

At the rise of the hand of a policeman stop quickly and do not attempt to pass him by or otherwise disrespect him.

If a pedestrian walks confidently in your pathway tootle him melodiously at first. If he still obstacles your passage tootle him with vigor and express by word of mouth the warning, "Hi, Hi."

Beware of the wandering horse that he shall not take fright as you pass him. Do not explode the exhaust box at him. Go soothingly by, or stop by the roadside till he pass away.

Give big space to the festive dog that make sport in the roadway. Avoid entanglement of dog with your wheel-spokes.

Go soothingly on the grease-mud, as there lurk the skid demon. Press the brake of the foot as you roll around the corners and save the collapse and tieup.

Rich County Project Has Been Finished

The various gravel surfaced projects completed during the past year have proved very satisfactory indeed. The latest addition is the Woodruff-Wyoming in Rich county. This road starts at the Utah-Wyoming line and extends northerly to Saleratus creek, near the town of Woodruff, a distance of 7.4 miles. It was nearly completed last fall, but the early advent of snow in that section caused the completion and acceptance to go over until quite recently, the road having been opened for traffic June 23. It was in excellent shape during the winter and spring, however, even though unfinished, and was used during that period.

This is the first road ever constructed in Rich county that was in good shape at the time of the spring break-up. There were no features different from those usual to roads of this type constructed in this state, except that an undulating grade line was designed to reduce excavation to the minimum, and minimize the snow trouble across this high valley where the altitude averages 6500 feet, with a heavy annual snow fall. At exposed locations hill summits are covered with the road graded a foot or more above the ground line, which under usual conditions, we expect to see cut down. In this region, however, cuts will be packed full of snow with every winter storm, while embankments are swept comparatively clear of snow blockades. During the past winter the wind kept the road fairly free from deep snow, and it was used during the entire winter with but little expense.

The citizens of that section of the state are now enthusiastic boosters for the present standard gravel surfaced roads and are anxious to arrange for additional projects in the near future.

Moab-La Sal Junction Road Completed

Federal-Aid Project No. 6, from Moab to La Sal Junction, in the counties of Grand and San Juan, was completed July 1. This project has been under construction for several years, there having been numerous delays prior to the final completion and acceptance of this 23 miles of road, mainly on account of the heavy cost and the difficulty of financing the undertaking. The road, however, is now completed and open to traffic, and its construction has proved to be of great benefit to the citizens of that part of the state. Good roads are of vital importance there, the nearest railroad point being Thompson, on the Denver & Rio Grande. From this station there is now an excellent highway to La Sal Junction, via Moab, a distance of 60 miles, and it is the intention to continue the work to and beyond Monticello, the county seat of San Juan, as rapidly as it is possible to secure the funds. The first section beyond La Sal Junction, a distance of 5 miles, will be placed under contract this fall.

Project 6 was designed originally as a graded earth road, twelve feet in width. Before construction had advanced very far, however, the plans were changed making it a twenty-four foot roadway to conform to the standard government section. In addition, surfacing has been required over several stretches, altogether eight miles of the project have been surfaced with shale or gravel, the last surfacing job to be completed being about three miles of gravel which is proving to be an exceptionally good type for that locality and in spite of the unusual drought of the present season.

Since this project was reopened for construction in the spring of 1923 the work has progressed without interruption until completion under charge of Resident Engineer H. J. Nielsen. This work has included the reshaping of the original roadway, all the surfacing, the construction of two Pack creek crossings, one a 234-foot submerged bridge, the other a 25-foot steel I-beam structure, a 60-foot span concrete bridge at Little Mule Shoe and a 20-foot span I-beam at South Wash beyond Big Mule Shoe. In addition a large number of box culverts and other minor drainage structures were installed.

Due to unsatisfactory progress on the part of the contractor the work was taken over by the state January 9 with Lewis R. Fife as foreman and pushed to completion as rapidly as possible and with some resulting profit to the contractor.

QUICK ON THE GETAWAY

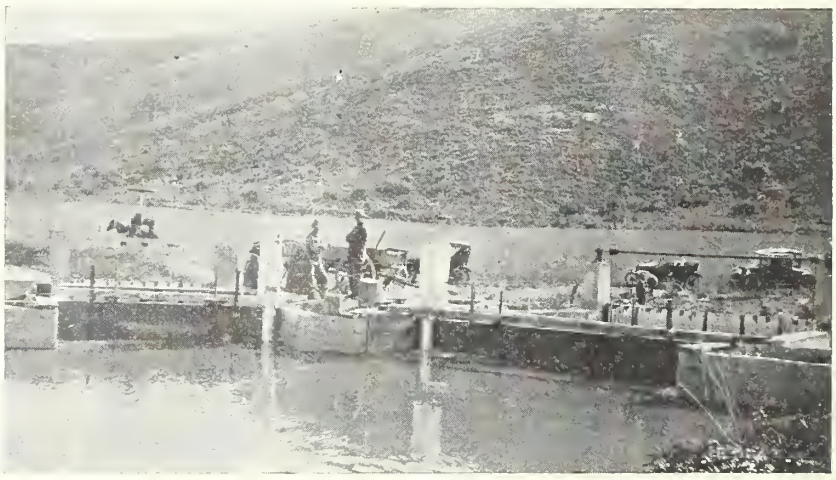
Lightning struck a barn at Peshtigo, ran along a steel track and down a rod into the stall where three mules were stabled. The lightning escaped uninjured.—Detroit News.

HUNTINGTON MAN DIES FROM CRUSHED SKULL

HUNTINGTON, July 4, 1924—Abel Nielson, forty-five years of age, dies from crushed skull. He was struck over the head by Jesse Hunt last Friday. The assault was the outgrowth of a quarrel over irrigation water. Hunt is in jail in Castle Dale and will be charged with first degree murder.

ASSAULT MAY CAUSE DEATH

July 10, 1924.—A. Sorensen, a farmer of Murray, who was hit over the head with a shovel, is in a very serious condition. If he dies William Marble will be charged with first degree murder, and if the man lives Marble will be charged with assault with a deadly weapon.



The Last Chance and the Turner Canal dividing 70 sec. ft. flow with Burnham Equipment

CACHE VALLEY MAN ARRESTED IN IRRIGATION QUARREL

July 12, 1924.—James B. Delamater of Logan was brought into the City Court yesterday charged with assault with a deadly weapon on the person of James Larsen. Assault was the outgrowth of a quarrel over the diversion of irrigation water.

Why kill one another or spend your life's savings in courts, quarreling over water when the Burnham Mfg. Co. can save you all this unpleasantness? We are at your service. Phone us Bountiful 1-3 or write us at Woods Cross, Utah. We guarantee our work, and will cheerfully give advice without cost to our customers.

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Some Additional Examples of Bridge Design

By MAURICE HOUSECROFT, Chief Bridge Draftsman

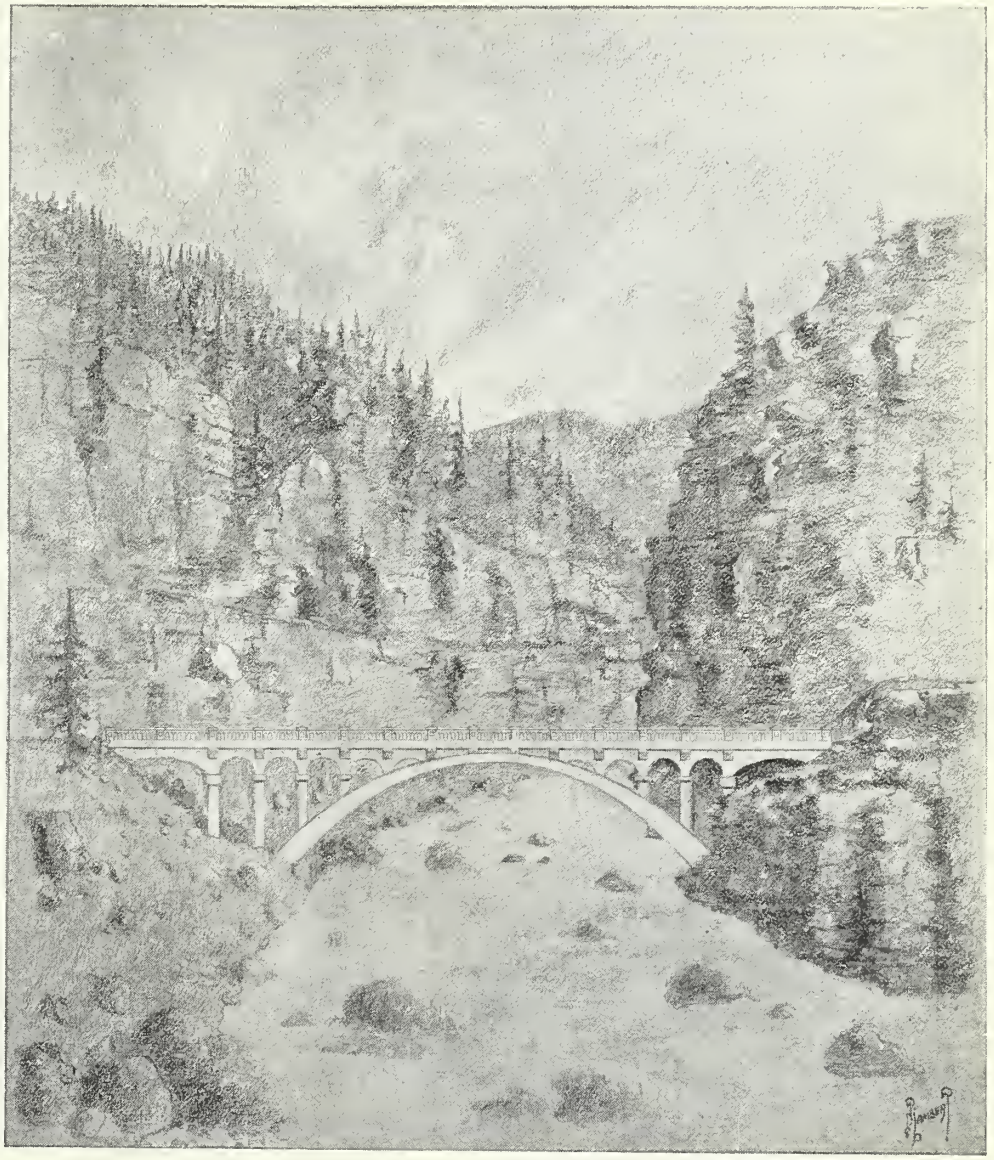
Projects in this year's program include a number of bridges of unusual importance and interest. Plans completed or nearing completion on ten projects for highway improvement in widely separate localities of the state carry designs for twenty bridges in addition to a larger number of smaller drainage structures of special design. These plans include two concrete structures, each larger than any other of its type heretofore built by the state road commission. One is a 250-foot concrete girder type to be built across the Bear river in Box Elder county, and is known as Project 63-B, the other a 130-foot clear span arch with approaches which will bring the total length to 200 feet will be built across Ash creek in Washington county as Project 55-B. Bids for the construction of five miles of road in Box Elder county and 8.6 miles over the Black Ridge in Washington county are to be opened this month and the bridges, which will form a necessary part of the improvement in each county, are to be advertised in the near future so that construction may proceed simultaneously with the improvement of the highway.

The artist of the engineering department, Needham Lambert, has sketched both bridges from the plans and drawn in the landscape which will form the setting for the completed structures, affording our readers a "pre-view" of what the bridge department is accomplishing.

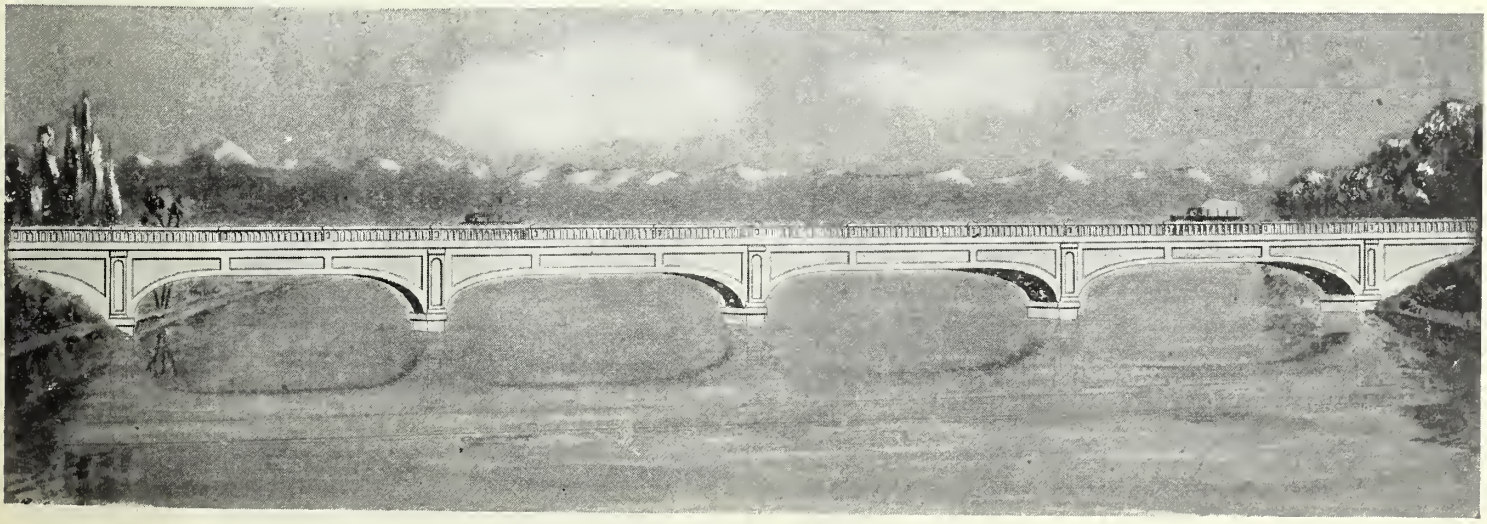
The arch over Ash creek will lead from the present highway on the east side of the stream to the new road which will be built on the west side and will eliminate the tortuous windings and dangerous dugways of the existing road from this point to the lower crossing of Ash creek.

Added to the beauty of line, permanence and low maintenance cost is the consideration that due to the peculiarities of the site which the arch will occupy it is from $16,000 to $20,000

(Continued on Page 12)



Proposed Arch over Ash Creek, Washington county



Proposed Bear river bridge, Box Elder county

Status of Federal Aid Projects

By F. S. THOMPSON, Chief Draftsman

UNDER CONSTRUCTION JUNE 30, 1924

No.	County	Name	Type	Lgth.	Per Ct. Comp.	Contractor	Estimated Cost
4-H	Emery	Rochester-Flat Bridge	Steel	75 ft.	90	J. T. Raleigh Co.	10,531.53
6-ABC	Grand-San Juan	Moab-LaSal Junction	Earth	23.25	100	Hyde & Black	372.423.13
10-B	Uintah	Ft. Duchesne-Vernal	Gravel	3.19	62	A. G. Young & Co.	69,596.17
10-C	Uintah	Ft. Duchesne-Vernal	Gravel	(1.31)	85	A. G. Young & Co.	
10-B	Uintah	Bridges for above	Wooden	4 Br.	78	Caldwell, Batty & Eaton	
17-B	Juab	Chicken Creek, Millard Co.	Gravel	13.87	33	Hawley, Anderson & Hinkley	93,686.67
24-C	Carbon	Price City	Concrete	1.12	19	Utah Concrete & Stucco Co.	76,839.69
31-A	Weber	Riverdale Overhead	Gravel	0.5	60	Union Construction Co.	43,072.63
31-B	Weber	Bridge for above	Steel	144 ft.	91	J. J. Burke Co.	43,974.86
33	Cache	Sardine Canyon	Gravel	6.96	85	Olaf Nelson	114,448.37
39	Salt Lake	Magna-Tooele Co. line	Concrete	6.41	96	Moran Paving Co.	210,674.70
42-A	Wasatch	Heber-Hailstone	Gravel	7.46	57	Gilkerson Const. Co.	68,904.85
42-B	Wasatch	Hailstone bridge	Steel	63 ft.	99	Christensen, Jacob & Gardner	21,682.61
43	Sevier	Richfield South	Concrete	1.5	23	Gray & Murdock	62,569.52
46	Rich	Woodruff-Wyoming	Gravel	7.4	100	Kroft & Bundy	51,537.00
47-A	Sanpete	Moroni City	Concrete	1.0	98	Reynolds Ely Co.	39,237.73
47-B	Sanpete	Moroni-Fountain Green	Gravel	7.09	98	Reynolds Ely Co.	53,298.19
47-C	Sanpete	Fountain Green	Concrete	1.0	98	Reynolds Ely Co.	32,774.95
47-D	Sanpete	Fountain Green-Juab Co.	Gravel	5.33	95	Reynolds Ely Co.	45,064.48
49	Summit	Gogorza-Salt Lake Co.	Gravel	3.06	45	Moss, Snarr & Thayne	40,448.27
50	Utah	Payson-Juab Co.	Concrete	8.56	37	Wasatch Grading Co.	261,464.68
51-A	Tooele	Knolls-Wendover (Salt Sec.)	Earth	6.06	64	N. E. Lamus	66,120.00
51-A	Tooele	Knolls-Wendover	Gravel	39.55	28	Kroft, Bundy, Zimmer & Lamus	280,000.00
52	Sevier	Salina-Redmond	Concrete	3.0	96	Gray & Murdock	96,288.13
53	Juab	Nephi City	Concrete	1.77	97	Wasatch Grading Co.	36,070.43
54	Iron	Cedar-Kanarra	Gravel	12.01	40	J. T. Raleigh Co.	110,427.19
56	Sevier	Redmond-Sanpete Co.	Gravel	2.13	0	Reynolds-Ely Co.	14,267.91
57	Sanpete	Gunnison City	Concrete	1.11	0	Reynolds-Ely Co.	42,068.70
57	Sanpete	Gunnison-Sevier Co.	Gravel	10.31	3	Reynolds-Ely Co.	93,141.82
58	Box Elder	Cache-Mantua	Gravel	4.14	53	Wheelwright Construction Co.	84,078.83
67	Millard	Scipio-Holden	Gravel	12.04	0	Hawley, Anderson & Hinckley	85,823.99

Projects Advertised in July

Plans on three gravel-surface projects were approved by the federal bureau and advertised during the month. They are: No. 19-B, Junction-Red Bridge in Piute county, 4.5 miles; No. 55-A, Iron county line to Ash creek, Washington county, 8.6 miles; and 63-A from end of pavement in Box Elder county to Bear River City, 6.0 miles. Project 66-A, Parowan-Winn Hollow, Iron county, was also approved but advertisement withheld upon request of the Iron county commissioners.

SOME ADDITIONAL EXAMPLES OF BRIDGE DESIGN

(Continued from Page 11)

cheaper than any type of steel bridge which could be fitted to this crossing.

The Bear river bridge will replace an antiquated steel truss and will be of a T-Beam type, plain and wholly utilitarian in appearance, but as the accompanying sketch shows, the usual severity of the lines of this type of structure have been merged into the graceful appearance of the arch span at very little additional cost.

While the foundations for the Ash creek arch will be "high and dry" and offer no impediment to construction, the great depth of alluvium in the bed of the Bear river makes suitable foundation for that bridge difficult to obtain. Soundings made in the stream bed show that it will be necessary to drive concrete piling, 25 feet long, through the quick sand to obtain sufficient bearing in the clay substratum.

Projects for which Plans have been Submitted

No.	County	Name	Type	Length
5D	Grand	Court House-Seven Mile Wash	Bridges	1-200 1-100 ft
60A	Summit	Echo-Emery	Gravel	11.0 Mi.
61C	Sevier	Sigurd Richfield	Gravel	6.5 Mi.
63B	Box Elder	Bear River Bridge	Reinf. Concrete	250 Ft.
63C	Box Elder	Malad River Bridge	Reinf. Concrete	100 Ft.
65A	Utah	Orem-Wasatch Co. Line	Gravel	3.4 Mi.
66A	Iron	Parowan-Winn Hollow	Gravel	9.6 Mi.
72A	Sanpete	Fairview-Mt. Pleasant	Gravel	5.0 Mi.

Plans in Course of Preparation

7A	San Juan	La Sal Junction-Wilson Wash	Gravel	7.0 Mi.
55B	Washington	Ash Creek Bridge	Concrete Arch	200 Ft.
61A	Sevier	Salina-Aurora	Gravel	4.2 Mi.
61B	Sevier	Aurora-Sigurd	Gravel	7.5 Mi.
71	Uintah	Uintah River Bridge	Steel	100 Ft.
77A	Sevier	So. Richfield-Elsinore	Gravel	5.5 Mi.
81A	Washington	Anderson Ranch LaVerkin	Gravel	4.0 Mi.

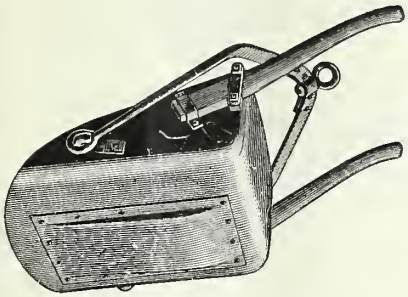
Surveys Completed

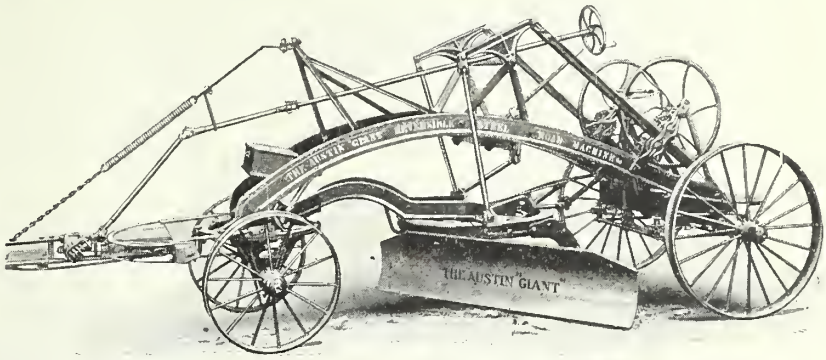
19D	Piute	Red Bridge-Garfield County	Gravel	3.5 Mi.
51B	Tooele	Timpie-Knolls	Gravel	35.0 Mi.
64A	Piute	Marysvale-Sevier	Gravel	4.9 Mi.
73A	Utah	Springville-Soldier Summit	Gravel	30.0 Mi.
81A	Sevier	Richfield-South	Gravel	1.57 Mi.

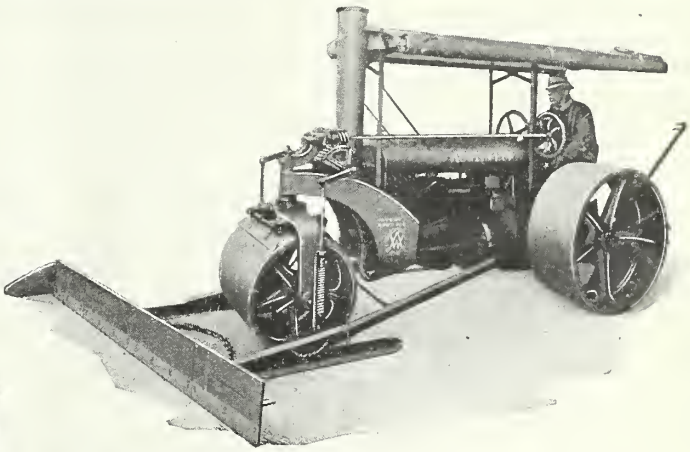
Proposed New Work

68A	Millard	Dog Valley-Cove Fort	Gravel	6.0 Mi.
68B	Millard	Dog Valley-Kanosh	Gravel	6.0 Mi.
69	Iron	Parowan-Buckhorn	Gravel	14.0 Mi.
94A	Duchesne	Myton-Antelope	Gravel	10.0 Mi.
98A	Beaver	Wildcat-Millard	Gravel	6.0 Mi.
98B	Millard	Cove Fort-Beaver Co. Line	Gravel	3.0 Mi.

The Leading Line of Earth Handling Machinery







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